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ROYAL BOTANIC GARDENS, KEW

I.—RESEARCHES ON SILENE MARITIMA AND S. VULGARIS: I.

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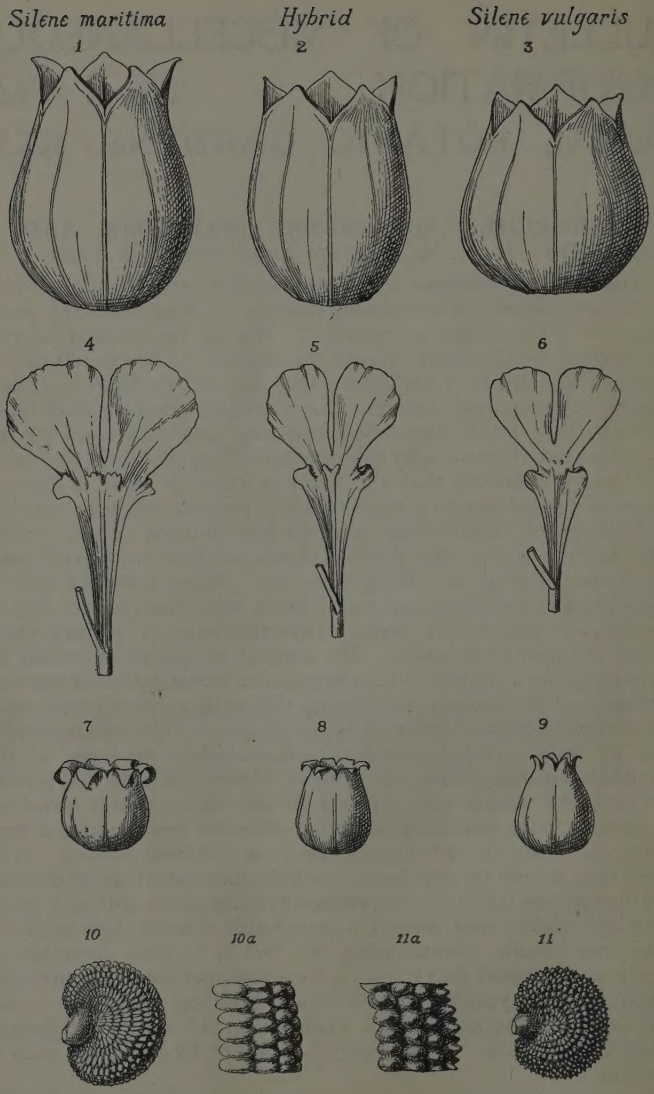
The exact significance to be attributed to the term "species" has been a subject of continuous interest, at least since the publication of "The Origin of Species." During the present century the modern development of such standpoints as the genetical and ecological has led to a realization that this old problem has many hitherto unrecognized aspects. An all-round observer might well conclude that while controlled breeding and field and garden researches have thrown light on many subsidiary problems, they have also clearly indicated that the main problem of what is the real nature of a plant species is more complex than has yet been realized.

Desirous of contributing towards the solution of the species problem as it affects some familiar plants, we have for several years been concentrating on two groups, viz., *Silene maritima* and *S. vulgaris** and *Centaurea nigra* and *C. jacea*, using these names, for the moment, in the widest sense. Investigations of certain other species are also in progress. The general principles on which we are working are as follows: (1) a systematic investigation of material accumulated in herbaria, correlating this with a critical reading of all published literature relevant to the subject; (2) a field investigation, by both phytogeographical and ecological methods, of the distribution of the species concerned in all their varieties and forms; (3) controlled selfing and growing in our experimental grounds; (4) growing pure line material under different environmental conditions to study the modifying effects of external factors. It is hoped later to add (5) cytological, and (6) anatomical investigations.

It is obvious that this comprehensive programme will take many years to complete, and, indeed, it is probable that we alone shall not attain our ideals. Nevertheless, we feel it is very desirable to emphasize our belief that it is only by a combination of all methods, herbarium, library, laboratory, field, and breeding, that there is any hope of obtaining satisfactory evidence on the nature and genesis of taxonomic units. No method is sufficient by itself, yet each is essential.

*This species has been variously termed *S. cucubalus*, *S. venosa*, *S. inflata*, *S. latifolia*, *S. angustifolia*, and *S. vulgaris* in recent works. T. A. Sprague in Journ. Bot. lxii. 45 (1924) has concluded that according to the Vienna Rules one of the last two names must stand. He has since informed us that he is now definitely of the opinion that *vulgaris* is the correct trivial. We concur and accordingly have adopted this view.



Silene maritima, 1 calyx, 4 petal, 7 capsule. Hybrid, 2 calyx, 5 petal, 8 capsule. *S. vulgaris*, 3 calyx, 6 petal, 9 capsule. (All × 2).

Seed, 10 (× 12), 10a (× 36), armadillo type; 11 (× 12), 11a (× 36), tubercled type.

We propose to publish our results from time to time in separate papers, each relatively complete in itself yet forming one of a series. The first paper presented here deals almost entirely with the results of crossing reciprocally *Silene maritima* and *S. vulgaris* and of selfing the F_1. In these experiments we have obtained considerable information concerning the genetical value of various morphological characters, and, though some of the figures are not yet satisfactorily interpreted, this preliminary work is sufficient to form a basis for extended genetical research.

Origin of parents.

Two plants of *Silene maritima* and one of *S. vulgaris* formed the original stocks for the experiments detailed below. They were all collected in the wild state and their identity numbers are :

A 1. *S. maritima*, hermaphrodite, and

A 2. *S. maritima*, female, both from Tilly Whin, near Swanage, Dorset, 1923.

B 1. *S. vulgaris*, hermaphrodite, from a roadside near Winchester, Hants, 1923.

Excepting for the sex of A2 the above plants were in every respect " normal " individuals quite comparable with what are understood by taxonomists as the type varieties of the two species. Their important characters are now described.

S. maritima A1.

Habit : compact, spreading, stems prostrate, up to 4·5 dm. long ; with barren stems.

Leaves very uniform for the different plants considered as wholes but fluctuating on the same plant from oblanceolate or narrowly oblong-elliptic to narrowly ovate or obovate, apex acute to obtuse, slightly apiculate, often conspicuously narrowed to base especially in the lower ones, uppermost pair slightly amplexicaul, middle leaves (average) 2 cm. long, 8 mm. broad, margins distinctly ciliate, texture thicker and stiffer than in *S. vulgaris*, colour glaucous green.

Inflorescence of 1–3 flowers, erect when in bloom. Bracts all strongly ciliate, lower green, herbaceous, similar to uppermost leaves, ovate, acute, upper smaller and narrower and becoming completely scarious.

Calyx broadly ellipsoid in flower, becoming broadly obovoid in fruit.

Corolla with petals divided $\frac{3}{4}$ length of lamina, segments and petals contiguous, 2·5 cm. long, 1·4 cm. broad. Corona of well developed scales. Corolla 2·6 cm. diam.

Immature seeds all pink (" pale Laelia pink " Ridgeway pl. xxxviii. 67 VR. f.).

Ripe capsules broadly ovoid, 10 mm. long (without teeth), 9 mm. broad (in broadest part below middle). Teeth each an isosceles triangle 4 mm. long, 2·5 mm. broad at base, strongly recurved.

Carpophore 3·5–4 mm. long, 3 mm. broad.

Mature seeds in flat outline broadly hemispherical, 1·5 mm. long, 1·25 mm. broad, distinctly tubercled with tubercles in well defined concentric half rings.

S. maritima A2 agrees with A 1 except

(1) pale purplish, not pure white, stigmas ;

(2) *seeds* (mature) in flat outline broadly hemispherical, 1·75 mm. long, 1·5 mm. broad, armadillo-pattern, i.e. without raised tubercles coming to a point, but marked out in low oblong smoothly flattened bosses or plates arranged in concentric half circles ;

(3) mainly female not hermaphrodite flowers (*see* below).

S. vulgaris B1.

Habit erect ; stems ascending below then straight erect, 3–9 dm. long ; with no barren shoots.

Leaves on the whole uniform except for fluctuations on same plant from broadly lanceolate, or ovate-lanceolate, to narrowly elliptic, apex acute apiculate, lower narrowed to the base, upper with subcordate to amplexicaul base, middle leaves (average) 4·5 cm. long, 1·2 cm. broad (actually the leaves on an individual shoot vary very greatly in size) ; margins ciliate, with variation in degree ; texture thinner and more flaccid than in *S. maritima* ; colour distinctly green.

Inflorescence up to 30 flowers, more or less dropping when in bloom ; bracts all at first green-herbaceous, many becoming later scarious, all very sparingly ciliate or lowest without cilia, lowest ovate, acuminate.

Calyx ovoid, contracted at apex, 1·3 cm. long, 1 cm. diam. ; teeth equilaterally triangular, apex acute apiculate.

Corolla with petals divided $\frac{2}{3}$ length of lamina, segments and petals not contiguous, 1·9 cm. long, 3–5 mm. broad ; corona only represented by the merest bosses ; corolla diam. 2·1 cm.

Immature seeds all white.

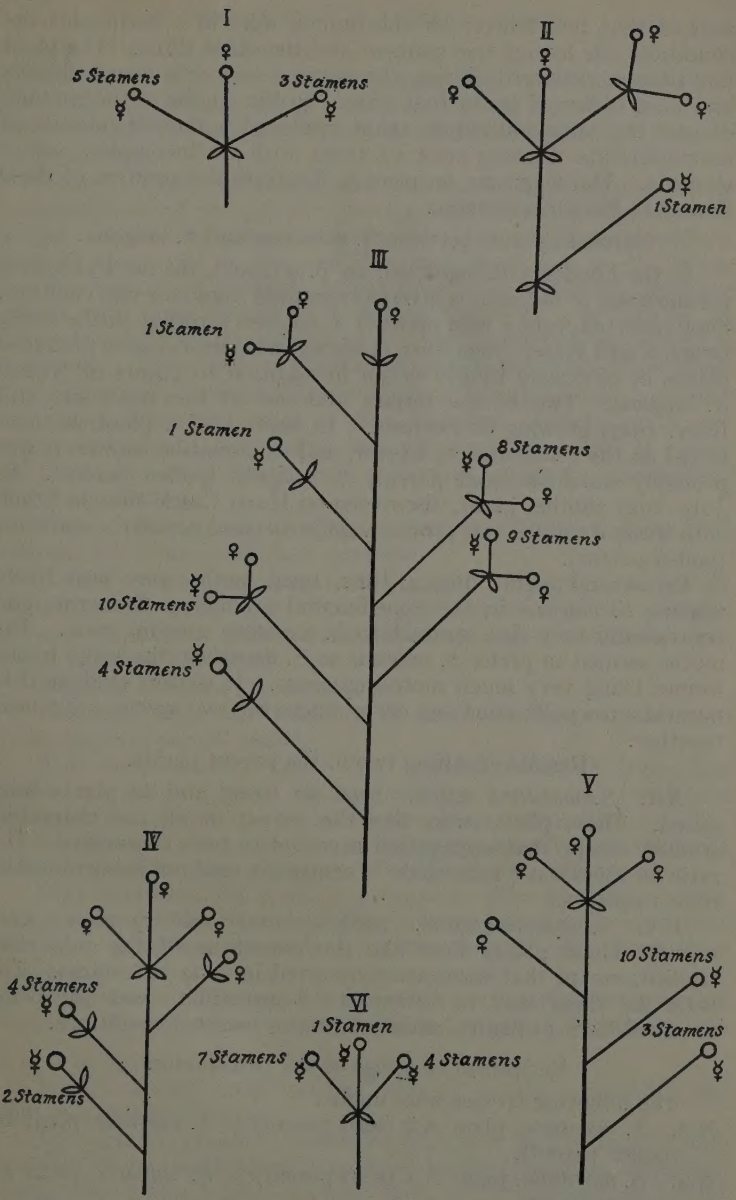
Ripe capsules broadly ovoid-ellipsoid, 8 mm. long (without teeth), 7 mm. diam. ; teeth equilaterally triangular, 1 mm. long, erect.

Carpophore 2·5 mm. long, 2·5 mm. diam.

Mature seeds in flat outline broadly hemispherical, 1·5 mm. long, 1·25 mm. broad ; distinctly tubercled with tubercles in rows not sharply defined.

The sex of the *S. maritima* plants.

One matter, which is here considered subsidiary and which is not followed up in this paper, may be mentioned for the sake of accuracy and general interest. The *S. maritima* A 1 plant has produced only hermaphrodite flowers since 1924, but the A 2 plant when collected in the wild and in 1924 had only functionally female flowers. In July, 1925, that is towards the end of its flowering period, it was



Silene maritima. Diagrams illustrating the sex of flowers in the inflorescence. I July, 1925. II July, 1926. III–VI All August, 1926. (*See* p. 4.)

noticed that two flowers on one branch were in a hermaphrodite condition, one having five stamens and the other three. The plant had been worked with during the summer and only female flowers had been observed up to that date. In the middle of the summer of 1926 the same individual again produced a limited number of hermaphrodite flowers, most of them with an incomplete set of stamens. The diagrams on page 5 illustrate the position of these flowers in the inflorescences.

Natural hybrids between *S. maritima* and *S. vulgaris*.

In the London Catalogue, ed. 10, p. 9 (1908), the natural hybrid (as *maritima* × *latifolia*) is given as recorded from two vice counties. Seed collected from a wild plant of *S. vulgaris* growing on the Little Orme, North Wales, when sown in our experimental ground produced plants of obviously hybrid origin in addition to plants of typical *S. vulgaris*. Two of the former and one of the latter are still (Nov. 1927) growing at Potterne. In Sept. 1926 a plant was collected on the Chesil Beach, Dorset, and examination showed it was probably *maritima* (seed parent) × *vulgaris* (pollen parent). In July, 1927 another plant, discovered on Hurst Castle shingle beach with the two species, was probably *vulgaris* (seed parent) × *maritima* (pollen parent).

On several nights during June, 1924, moths were seen freely visiting *S. vulgaris* in the experimental ground at Potterne, and occasionally they flew straight to *S. maritima* growing near. The moths seemed to prefer *S. vulgaris* to *S. maritima*, the visits to the former being very much more numerous. It is thus evident that natural cross-pollination can occur where the two species grow near together.

Results of selfing two of the parent plants.

A 1. *S. maritima* selfed. Seed set freely and 24 plants were raised. These plants were like the parent in all the characters studied except that segregation occurred in testa characters. The ratio for these was 8 tubercled : 6 armadillo, seed not being obtained from 10 plants.

B 1. *S. vulgaris* selfed. Seed set freely and 27 plants were raised. These plants were like the parent in all the characters studied, except that segregation occurred in testa characters. The ratio for these was 12 tubercled : 2 armadillo, seed not being obtained from 13 plants, mainly owing to seasonal conditions.

Reciprocal crossings of the two species.

The following crosses were made :

N.3. *S. maritima*, plant A 2 (seed parent) × *S. vulgaris*, plant B1 (pollen parent).

N.4. *S. maritima*, plant A 1 (seed parent) × *S. vulgaris*, plant B1 (pollen parent).

N.5. *S. vulgaris*, plant B 1 (seed parent) × *S. maritima*, plant A 1 (pollen parent).

Descriptions of F_1 of above crosses.

N.3 and N.4. 61 plants raised.

Habit. Height of stems up to 3–6·5 dm. long; general habit distinctly spreading; stems ascending at least towards the ends; no barren procumbent stems; stems all glabrous (as were those of both parents).

Leaves. Fairly uniform in size and shape; in size intermediate between those of the parents, but decidedly nearer to *S. vulgaris*; shape ovate-lanceolate, oblanceolate, or elliptic-lanceolate, varying thus even on one and the same shoot, but on the whole tending towards *S. vulgaris* rather than to *S. maritima*; margins ciliate, with slight variations in degree of ciliation; texture on the whole intermediate, transverse sections of leaves varying a little in thickness. There are very slight differences in the shade of the green.

Inflorescence. Intermediate in degree of luxuriance and in number of flowers which are more or less drooping. Bracts ovate, distinctly acuminate, herbaceous and scarious (as in both parents); all plants had some bracts with some cilia, majority intermediate between parents.

Calyx intermediate in shape; less contracted at apex than *vulgaris* but more ovoid than *maritima*.

Corolla with the petals divided $\frac{3}{4}$ length of lamina (as *maritima*), segments and petals not over-lapping, intermediate in breadth; 2·1–2·3 cm. diam.; corona intermediate in degree of development, but a scale not a boss.

Stigmata coloured and uncoloured.

Immature seeds pale Laelia pink (*maritima* parent pale Laelia pink, *vulgaris* parent white).

Ripe capsules: (1) cross N.3 ellipsoid-ovoid, 8 mm. long (without teeth), 7 mm. diam.; teeth 3 mm. long, equilateral triangles, spreading; carpophore 3 mm. long, 2 mm. diam.

Mature seeds: (1) cross N.3 in flat outline broadly hemispherical, length 2 mm., breadth 1·5 mm., tubercled or armadillo pattern.

Ripe capsules: (2) cross N.4 broadly ellipsoid-ovoid, 7 mm. long (without teeth), 7 mm. diam.; teeth 2·5 mm. long, equilateral triangles, spreading; carpophore 2·5 mm. long, 2·5 mm. diam. (with 2 exceptions).

Mature seeds: (2) cross N.4 in flat outline broadly hemispherical, length 2 mm., breadth 1·5 mm., tubercled or armadillo pattern.

N.5. 30 plants raised.

Habit, leaves, inflorescence, calyx, corolla, stigmata, and immature seeds as former.

Ripe capsules broadly ellipsoid-ovoid, 7 mm. long (without teeth), 7–8 mm. diam.; teeth 2 mm. long, equilaterally triangular, spreading; carpophore 2 mm. long, 2–2·5 mm. diam. (for 1 exception *see* below).

Mature seeds in flat outline broadly hemispherical, length 1·5 mm., breadth 1·25 mm., tubercled or armadillo pattern.

Comments on the plants of the F_1 generation.

All of the individuals of the three crosses made are extremely uniform in all the characters studied with the exceptions now enumerated. In most of the characters the F_1 plants are exactly intermediate between the characters of the parents, as, for example, in calyx shape, scale and boss of petal, and capsule shape and teeth (*see* page 2, figs. 1 to 9). That the F_1 generation is, for the majority of the characters, strikingly intermediate needs particular emphasis, because we are forced now to occupy a good deal of space in dealing with the exceptions to this generalization.

Stigma colour. Preliminary observations showed that some plants in the F_1 generation had coloured (i.e., purplish), and others colourless stigmata. Exact counts for each cross yielded the following figures :—

N.3. 17 purplish : 13 colourless.
N.4. 14 purplish : 16 colourless.
N.5. 11 purplish : 19 colourless.

It may seem that these results could be explained by accepting two complementary factors as necessary for the production of colour in the stigmata. If these be designated by A and B, then the parents might, on the above figures, be postulated as :—

in N.3 : Aa Bb × aa BB.
in N.4 : Aa bb × aa BB.
in N.5 : aa BB × Aa bb.

Capsule shape and teeth. The essential differences between the capsules of *S. maritima* and *S. vulgaris* are clearly indicated in the descriptions and figures. With the exception of three plants out of a total of 91 in our F_1 generations all the individuals have an exactly intermediate type of capsule. In cross N.4 two plants and in cross N.5 one plant had capsules of the *maritima* type. At present we can offer no explanation of this. It is noteworthy that no *vulgaris* type of capsule appeared, nor any approaching it.

Testa characters. Usually it is quite easy to place all the mature seeds from any one plant into one or other of our two categories, tubercled and armadillo. There are, however, degrees in both. We know that our stock plants A 1 and B 1 are impure for these characters since they gave seeds of both types on selfing. On crossing segregation is also evident, as the following figures show :—

	Tubercled	Armadillo
N.3.	14	11
N.4.	11	16
N.5.	15	14
Totals	40	41

The evidence obtained from the F_2 generation shows as conclusively as we could wish that the armadillo character is recessive. N.3 is a cross between a recessive and a heterozygote and the ratio 14 : 11 may be considered, allowing for the small numbers, an approximation to the expected 1:1 ratio. On the other hand the ratios obtained for the F_1s from crosses N.4 and N.5 are at present inexplicable.

There are further complications in testa characters concerning which we are continuing our investigations.

The F_1 plants selected for selfing.

Six generations of F_2 plants were raised from seeds obtained by selfing as many individuals of the F_1 generations. The designations and origins of these F_2 generations are as follows :—

N.3 II. from an N.3 plant with armadillo seeds.
N.3 III. from another N.3 plant with armadillo seeds.
N.4 V. from an N.4 plant with tubercled seeds.
N.4 VI. from an N.4 plant with armadillo seeds.
N.5 VII. from an N.5 plant with armadillo seeds.
N.5 VIII. from an N.5 plant with armadillo seeds.

It may be explained that the counts given below do not always tally with the total number of plants raised in each generation, since it was not possible to determine the character concerned in every individual. Thus some plants failed to produce good capsules or mature seeds and the counts of such perforce fall below the total of the plants. The total number of plants of F_2 generations grown was 207.

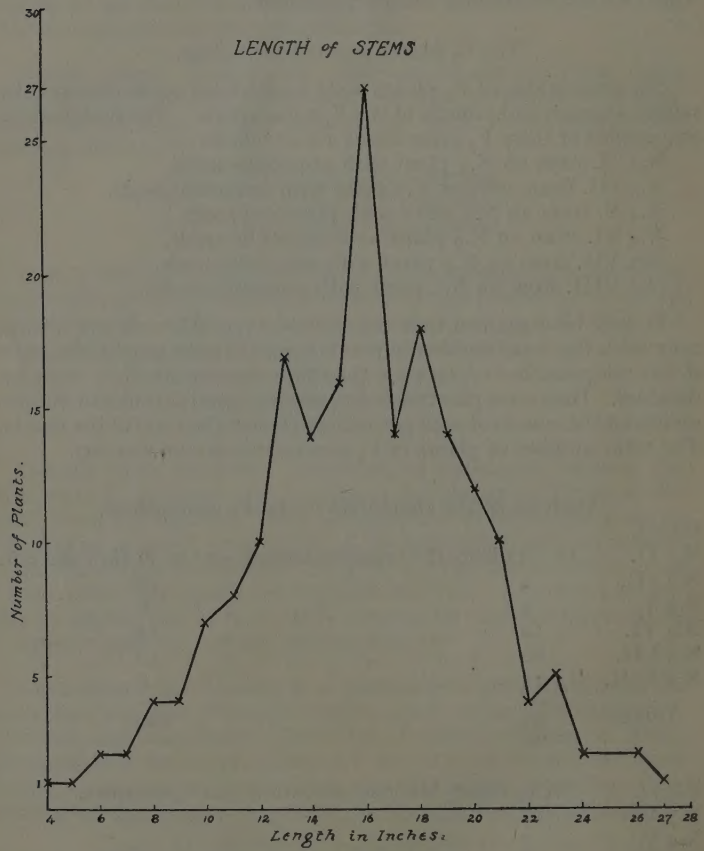
Analyses of the characters of the F_2 generations.

HABIT.

N.3 II.	In	4	plants	the	branches	spread	out : in	11	they did not.
N.3 III.	,,	4	,,	,,	,,	,,	19	,,	,,
N.4 V.	,,	4	,,	,,	,,	,,	6	,,	,,
N.4 VI.	,,	12	,,	,,	,,	,,	12	,,	,,
N.5 VII.	,,	60	,,	,,	,,	,,	46	,,	,,
N.5 VIII.	,,	15	,,	,,	,,	,,	6	,,	,,
Totals		99					100		

N.3 II.	In	14	plants	branches	ascending : in	1	prostrate.
N.3 III.	,,	21	,,	,,	,,	2	,,
N.4 V.	,,	7	,,	,,	,,	3	,,
N.4 VI.	,,	18	,,	,,	,,	6	,,
N.5 VII.	,,	77	,,	,,	,,	29	,,
N.5 VIII.	,,	10	,,	,,	,,	11	,,
Totals		147				52	

N.3 II.	In 13 plants barren shoots present : in 2 they were not.							
N.3 III.	,, 20	,,	,,	,,	3	,,	,,	
N.4 V.	,, 10	,,	,,	,,	0	,,	,,	
N.4 VI.	,, 22	,,	,,	,,	2	,,	,,	
N.5 VII.	,, 85	,,	,,	,,	21	,,	,,	
N.5 VIII.	,, 19	,,	,,	,,	2	,,	,,	
Totals	169				30			



STEMS : all F_2 generations counted together.

Length in inches	...	4	5	6	7	8	9	10	11	12	13	14	15
Number of plants	...	1	1	2	2	4	4	7	8	10	17	14	16
Length in inches	...	16	17	18	19	20	21	22	23	24	25	26	27
Number of plants	...	27	14	18	14	12	10	4	5	2	2	2	1

LEAVES :

The following symbols are used here : M=as in *S. maritima*, HM=*maritima* verging towards the hybrid, MH=*maritima* verging still more towards the hybrid, H=hybrid, VH=hybrid verging towards *vulgaris*, HV=hybrid verging still more towards *vulgaris*, V=as in *S. vulgaris*.

	M	HM	MH	H	VH	HV	V
N.3 II.		8	1	5			1
N.3 III.		3		10	1	4	5
N.4 V.		1	1	3	1	2	2
N.4 VI.	1	5	1	1		9	8
N.5 VII.	2	8	1	31		13	51
N.5 VIII.	6	9	3	6		2	
Totals ...	9	34	7	56	2	30	67

FLOWERS : Numbers on flowering branches :

N.3 II.	In 2	plants many, in	13	plants few.
N.3 III.	,, 2	,, ,,	21	,,
N.4 V.	,, 3	,, ,,	7	,,
N.4 VI.	,, 17	,, ,,	6	,,
N.5 VII.	,, 55	,, ,,	33	,,
N.5 VIII.	,, 14	,, ,,	6	,,
Totals	93		86	

Position relative to the pedicel :

N.3 II.	In 1	plant erect, in	13	plants drooping.		
N.3 III.	,, 1	,, ,,	19	,,	,,	
N.4 V.	,, 1	,, ,,	9	,,	,,	
N.4 VI.	,, 1	,, ,,	20	,,	,,	
N.5 VII.	,, 9	,, ,,	38	,,	,,	
N.5 VIII.	,, 7	,, ,,	10	,,	,,	
Totals ...	20		109			

CALYX SHAPE : The same symbols are used as for the leaves.

	M	HM	MH	H	VH	HV	V
N.3 II.	3	2		9			
N.3 III.	7	8	1	3		3	1
N.4 V.	7			1		1	1
N.4 VI.	1		1	11		7	3
N.5 VII.	13	18	3	32	3	14	6
N.5 VIII.	5	2		3			11
Totals ...	36	30	5	59	3	25	22

PETALS : Degree of lobing :

N.3 II.	In	0	plants	$\frac{2}{3}$,	in	11	plants $\frac{3}{4}$ lobed.
N.3 III.	,,	0	,,		20	,,	,,
N.4 V.	,,	5	,,		5	,,	,,
N.4 VI.	,,	6	,,		16	,,	,,
N.5 VII.	,,	15	,,		36	,,	,,
N.5 VIII.	,,	1	,,		19	,,	,,
Totals ...		27			107		

Overlapping :

N.3 II.	In	0	plants	contiguous	or	overlapping,	in	13	not contiguous	
N.3 III.	,,	4	,,	,,	,,	,,	,,	17	,,	,,
N.4 V.	,,	2	,,	,,	,,	,,	,,	8	,,	,,
N.4 VI.	,,	4	,,	,,	,,	,,	,,	18	,,	,,
N.5 VII.	,,	10	,,	,,	,,	,,	,,	41	,,	,,
N.5 VIII.	,,	9	,,	,,	,,	,,	,,	10	,,	,,
Totals ...		29						107		

Coronal development :

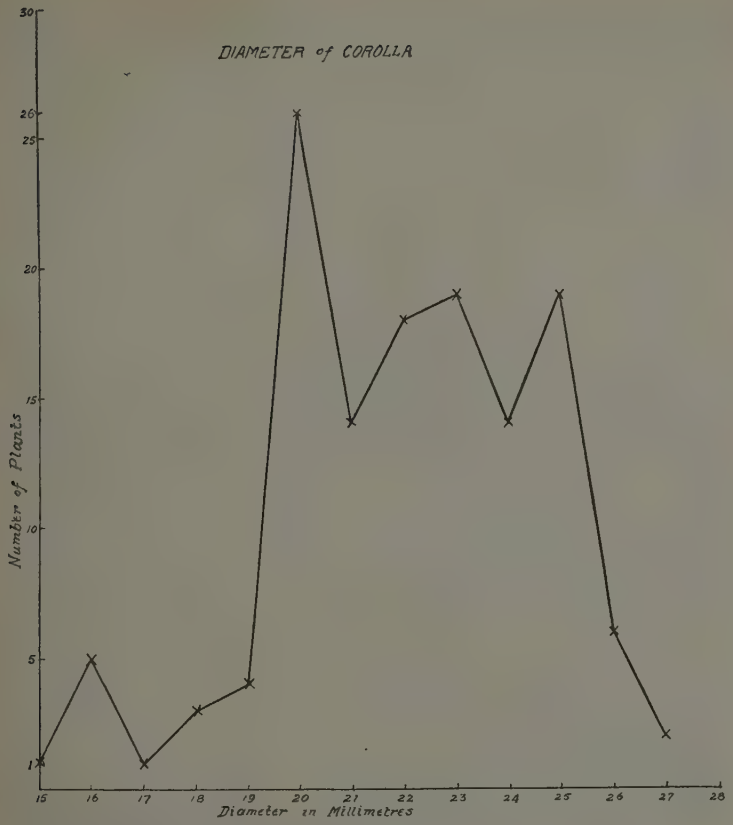
N.3 II.	In	0	plants	scale,	in	3	intermediate,	in	10	boss
N.3 III.	,,	3	,,	,,		14	,,		4	,,
N.4 V.	,,	3	,,	,,		6	,,		1	,,
N.4 VI.	,,	2	,,	,,		13	,,		7	,,
N.5 VII.	,,	17	,,	,,		21	,,		16	,,
N.5 VIII.	,,	4	,,	,,		12	,,		4	,,
Totals ...		29				69			42	

DIAMETER OF COROLLA :

In mm.	15	16	17	18	19	20	21	22	23	24	25	26	27
Number of plants ...	1	5	1	3	4	26	14	18	19	14	19	6	2

COLOUR OF STIGMATA :

N.3 II.	In	5	plants	purplish,	in	9	colourless.
N.3 III.	,,	3	,,	,,		19	,,
N.4 V.	,,	4	,,	,,		6	,,
N.4 VI.	,,	0	,,	,,		22	,,
N.5 VII.	,,	2	,,	,,		68	,,
N.5 VIII.	,,	0	,,	,,		21	,,
Totals ...		14				145	



COLOUR OF IMMATURE SEEDS :

N.3 II.	In	8	plants pale Laelia pink, in		6	colourless.
N.3 III.	,,	15	,,	,,	7	,,
N.4 V.	,,	7	,,	,,	3	,,
N.4 VI.	,,	16	,,	,,	7	,,
N.5 VII.	,,	36	,,	,,	53	,,
N.5 VIII.	,,	15	,,	,,	5	,,
Totals ...		97			81	

MATURE SEEDS :

N.3 II.	In	0	plants tubercled, in		11	plants armadillo.
N.3 III.	,,	0	,,	,,	16	,, ,,
N.4 V.	,,	4	,,	,,	1	,, ,,
N.4 VI.	,,	0	,,	,,	15	,, ,,
N.5 VII.	,,	0	,,	,,	62	,, ,,
N.5 VIII.	,,	0	,,	,,	12	,, ,,

CAPSULES : The symbols used have the same significance as for the leaves.

	M	HM	MH	H	VH	HV	V
N.3 II.		2		2		5	3
N.3 III.				10		7	1
N.4 V.	3	1		1			
N.4 VI.	2	1		5	2	5	1
N.5 VII.	6	13	2	26	5	3	7
N.5 VIII.	2	1		5	1		
Totals... ...	13	18	2	49	8	20	12

Note on a disease of *Silene*.

For the last two years (1926-27) we have been troubled both at Potterne and Kew with a fungus, which is one of the *Imperfecti* and has been determined very provisionally by Miss E. M. Wakefield as a species of *Marssonina*. The life-history of the fungus is being studied at Kew. The year 1927 was exceptional, since from the middle of June till nearly the end of August it was continually wet with comparatively little sun, conditions presumably very favourable for the spread of this fungus. Plants of *Silene vulgaris* suffered very badly indeed, leaves, stems, and calyces being affected. The stems are turned brown and brittle by the fungus, while the calyces become brown and semi-transparent. Nevertheless plants were able to ripen seeds and comparatively good crops of these have been obtained. For the first time *Silene maritima* was slightly affected in 1927, some of the stems turning brown. The leaves escaped, and in September no ill-effects could be seen. The plants of *S. vulgaris* at Potterne were completely devastated and had made little or no secondary growth, though those at Kew, of quite different stocks, had largely recovered. The F_1 hybrids and most of the F_2 segregates suffered badly at Potterne, but to a less extent than pure *S. vulgaris*, presumably as a result of the resistant factor from *S. maritima* coming into play. In September excellent secondary growth had been produced, and on the whole the plants looked green and healthy, though some further infection was noted. The same disease was seen in wild plants growing in arable land near Potterne in July.

Considerations of the results obtained in F_2.

Habit. The ratio of 99:100 for the spreading or compact nature of the branch system does not appear to be a straightforward Mendelian ratio. Moreover, our field observations suggest that we are certainly not dealing here with specific characters. The figures for the separate crosses suggest an irregular fluctuation. On the other hand the ascending habit is a definite character of the *S. vulgaris* parent as opposed to the prostrate habit of the *S. maritima* parents. In the F_1s the habit was ascending and the dominant nature of this character is clearly indicated by the F_2

ratio of 147:52. The third pair of habit characters, the presence and absence of barren shoots, has given what is almost certainly an abnormal result. As stated above, a fungus disease did very much damage to our plants. It is most probable that the killing off of flowering branches caused the development of buds from the lower parts, and these were unavoidably counted as barren shoots. The apparent very marked bias towards *S. maritima* in this character in the F_2 can thus be explained as due to stimulation by an exceptional environmental factor, dominance being overcome and the recessive character expressing itself.

Stems. The length of the stems is a fluctuating character in the parents, and though the maximum stem length for each plant was measured it was thought sufficient to summarize the results in a graph. The chief mode is at 16 inches, with subsidiary ones at 13 and 18, and a very insignificant one at 23. None of the F_2 plants reach the maximum attained in the parent *S. vulgaris*. The hairy character known in some varieties of *S. vulgaris* was not introduced and did not appear in the course of the experiments detailed here.

Leaves. Considered as a whole the foliage in F_2 shows a marked bias towards *S. vulgaris*. We have given a very detailed analysis, and taking the totals it may be suggested that by adding M, HM, and MH together, and contrasting with the totals obtained by adding together H, VH, HV, and V, a very approximate 1:3 ratio is obtained, i.e., 50:155.

Flowers. The number of flowers on the flowering branches is a fluctuating character and it is very doubtful if the character has any genetical significance. It will be recalled that the parent *S. maritima* plants had few flowers and the *S. vulgaris* parent many, while the hybrid on the average had many. Field observations have clearly indicated that in both species this character is easily modified by environmental conditions and certainly our figures appear to have no purely genetical explanation.

The flower position relative to the pedicel shows a very strong predominance towards the drooping habit of our *S. vulgaris* parent. The proportions have been much upset by the fungus attack, making it impossible to be certain of the character in many plants, but there is no reasonable doubt that drooping is dominant to erect.

Calyx shape. We have made a careful attempt to analyze this by using 7 categories. The results are somewhat puzzling. In the M column we placed only obvious *maritima* calyces. Possibly a few of the plants counted as HM should have been included under M. There is a well marked break between the H and HV columns, so that some justification may be found for adding the last two columns together. As our figures stand we can thus obtain a proportion of 36:97:47, which is an approximation to a 1:2:1 ratio.

Petals. The degree of lobing and the overlapping give figures which indicate a 3:1 ratio, namely $\frac{3}{4}$-lobing 3·9 : $\frac{2}{3}$-lobing 1, and also not-contiguous 3·6 : contiguous 1.

In coronal development dominance fails and the F_1 intermediate type reappears in the largest numbers in F_2. While our figures do not give an exact 1:2:1 ratio they certainly point to this. Again we were very careful only to include very definite scales in the M column and were prepared to find an over-balance in the intermediate and boss columns. The exact figures obtained were 29:69:42.

Diameter of corolla. Field observations have shown that there is a very wide range of variation in this character, partly correlated with habitat and season. Our original *S. maritima* parents had larger flowers (26 mm.) than the *S. vulgaris* parent (21 mm.). The graph seems to indicate some sort of segregation, since there is a mode at 20 which would correspond to the *vulgaris* type and another at 25 which would correspond to the *maritima* type. The mode at 23 may be due to the overlapping of maximum *vulgaris* and minimum *maritima* measurements. The small mode at 16 does not seem to have any significance.

Colour of stigmata. The explanation which appeared possible for the F_1 plants, on the basis of two complementary factors, breaks down entirely in the F_2 and we content ourselves for the time being with stating the following facts. In N.3 II. and N.3 III. colour was introduced in the original *S. maritima* parent while the *S. vulgaris* parent had colourless stigmata. In the F_1 plants with purplish and others with colourless stigmata appeared. In F_2 again both types occurred. In the other families both the original parents had colourless stigmata yet plants with purplish and others with colourless appeared in both F_1 and F_2. The degree of colouration varied, but we have not yet obtained a clue to any Mendelian explanation which will fit all our figures.

Colour of immature seeds. Both the original *S. maritima* parents had pink seeds and the *S. vulgaris* parent white. The F_1 generations had pink seeds. The expectation was to obtain a 3:1 ratio in F_2. The ratio for the totals actually obtained was 97:81. All the way through, and also in wild plants of both species, there is a considerable range in the intensity of the colour. The colour of both the stigmata and of the immature seeds is being further investigated.

Capsules. The factor inheritance for capsule shape is very clear. The F_1 plants had all (with 3 exceptions) capsules intermediate between those of the parents (*see* page 2, fig. 8). In F_2, taking the figures for M and HM together, those for MH, H, and VH, and those for HV and V, we obtain the ratio 31:59:32, that is, almost exactly, 1:2:1. A re-checking of the capsules for each plant has convinced us that we are perfectly justified in so interpreting our figures.

Mature seeds. Here we have to deal with the two seed-coat characters tubercled and armadillo. Of the original parents A1 (*S. maritima*) and B1 (*S. vulgaris*) were tubercled, and on selfing proved to be heterozygous, a fact confirmed in subsequent generations, while A2 (*S. maritima*) was armadillo, a character which has proved to be recessive. As two out of the three original plants were heterozygous

it is necessary to consider the F_2 families individually. N.3 II. and N.3 III. were plants of the F_1 generation selected for selfing and each had armadillo seeds. They yielded in the F_2 only armadillo seeds. N.4 V. and N.4 VI. were plants of another F_1 generation, the former having tubercled, the latter armadillo seeds. The offspring from the selfing of N.4 V. gave four tubercled plants and one armadillo. This certainly represents a 3:1 ratio and indicates that the selfed F_1 plant was heterozygous, the tubercled factor being dominant over the armadillo. N.4 VI. again gave only armadillo plants. N.5 VII. and N.5 VIII., from a third F_1 generation, were plants with armadillo seeds, and this character alone appeared when each was selfed.

Summary.

We here arrange under three headings the conclusions, so far reached, concerning the genetical behaviour of the characters studied.

Characters with a genetic basis.

(1). Ascending or prostrate habit, the former dominant.
(2). *Vulgaris* or *maritima* foliage, the former dominant.
(3). Drooping or erect flowers, the former dominant.
(4). *Vulgaris* or *maritima* calyx, dominance fails, F_2 1:2:1.
(5). Lobing of petals $\frac{3}{4}$:$\frac{2}{3}$, the former dominant.
(6). Petals not contiguous or contiguous (or overlapping), the former dominant.
(7). Scale or boss on petals, dominance fails, F_2 1:2:1.
(8). *Vulgaris* or *maritima* capsules, dominance fails, F_2 1:2:1.
(9). Tubercled or armadillo seeds, the former dominant.

Characters not interpreted on a genetic basis and possibly not factorially inherited.

(10). Compact or spreading nature of the branch system.
(11). Length of stems.
(12). Number of flowers on flowering branches.

Characters not yet interpreted genetically but probably segregating.

(13). Presence or absence of barren shoots.
(14). Diameter of corolla.
(15). Colour of stigmata.
(16). Colour of immature seeds.

Samples of the material dealt with in this paper are preserved at the Herbarium at Kew.

II.—NEW SPECIES OF NOTOTRICHE FROM CHILE WITH NOTES ON MALVASTRUM.

A. W. Hill.

Among Dr. E. Werdermann's Chilean plants, collected in the year 1926 in the Provinces of Tacna, Tarapacá and Atacama, six distinct species of the genus *Nototriche* are represented, two of which are annuals.

Of the perennial species one, No. 973, from the Cordillera Rio Figueroa, Prov. Atacama, proves to be *Nototriche holoserica* A. W. Hill, described in *Kew Bulletin*, 1927, p. 248, from a specimen collected by Dr. Werdermann two years before and also by Dr. Ivan M. Johnston in the same region.

Another, No. 1085, from the Cordillera Arroyo Coyacagua, Peña blanca, at about 4000 m., is identical with *Nototriche rugosa* A. W. Hill, collected by Philippi in the Cordillera of Tarapacá, and does not appear to have been collected by anyone else.

A third perennial species, No. 1082, from the Cordillera Cerro Columfusca, Prov. Tarapacá, unfortunately bears no flowers, but it probably should be referred to *Nototriche Philippii* A. W. Hill. The leaves are covered with a fine grey velvety tomentum on both sides, thus differing from *N. rugosa* where the lower side of the leaf is almost glabrous, but the leaves are a good deal larger, and it may be a robust example of *N. Philippii*.

The other perennial species, No. 1071, also from the province of Tarapacá, appears to be allied to *N. pulvilla* A. W. Hill, but proves to be quite a distinct species. It is distinguished by the leaves being nearly glabrous and strongly nerved on the lower surface and in having the tips of the stipules projecting beyond the leaves and also in the long beaks to the carpels.

Nototriche pulvinata A. W. Hill (×3).

Nototriche pulvinata *A. W. Hill*; species *N. Philippii* A. W. Hill affinis, sed foliis dorso subglabris conspicue nervatis, stipulis elongatis, carpellis longe rostratis praecipue differt.

Fruticulus depressus, caespitosus, pulvinatus, cinerascens; caudex subterraneus, crassus, lignosus, ramosus. *Folia* dense aggregata, rosulata; petiolus 1·2 cm. longus; stipulae fere usque ad apicem petioli adnatae et cum eo quasi vaginam subglabram 1 cm. longam formantes, parte libera membranacea lanceolata-acuta

6–7 mm. longa laminam superante, ad margines pilis stellatis sparsis instructae ; lamina ambitu semicircularis vel obcuneata, 3–4 mm. longa, 6–8 mm. lata, supra pilis stellatis asperulis sparse instructa, infra subglabra, conspicue nervata, inter lobum medium et lobos laterales infra medium incisa, 7–9-fida, lobis lateralibus 3–5-fidis ; lobulae carnosae, obtusae, dense confertae. *Calyx* circa 7 mm. longus, infra glaber, lobis 2 mm. longis extus pilis stellatis asperulis instructis intus glabris. *Corolla* 1·2 cm. longa ; petala late obovata, apice emarginata, basi in tubum 5 mm. longum coalita ; stamina pauca, in caput globosum aggregata. *Carpella* 7 mm. longa, birostrata, pilis stellatis asperulis instructa, rostris 3 mm. dorso longis, pilis longioribus, in structis.

CHILE. Prov. Tarapacá : Cordillera Cerro Columfusca ; Aguada, circa 4400 m., *Werdermann* 1071.

The two annual species are of particular interest, and both come from the volcano of Tacora in the Province of Tacna. Both represent undescribed species, and neither very closely resemble the only two annual species hitherto discovered, *N. pygmaea* A. W. Hill, collected by D'Orbigny near the Laguna de Potosi, Bolivia, due east of Tacna, and *N. pusilla* A. W. Hill, collected by Weddell and again by Weberbauer in Peru to the north of Cerro de Pasco.

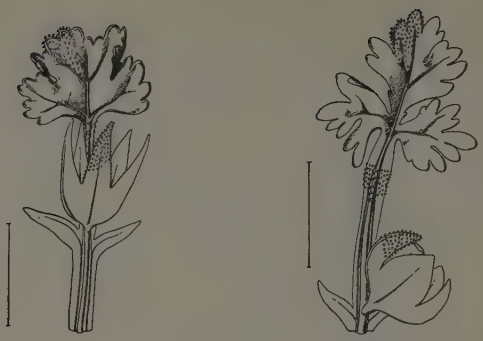
These two new plants differ from the earlier-known species especially in having the leaf lamina trilobed in one case about halfway and in the other completely to the base. They are evidently nearly allied to each other, but differ sufficiently in size, in the nature of the tomentum and in leaf and fruit characters to be regarded as distinct species.

The descriptions are as follows :—

Nototriche nana *A. W. Hill*; species *N. pusillae* A. W. Hill assimilis, sed laminis ad basin tripartitis, carpellis erostratis praecipue differt.

Herba annua, prostrata, caespitosa, ramis axillaribus 1–3 cm. longis solo adpressis. *Folia* aggregata, rosulata, cinereo-viridia, uti rami minute et sparse stellato-tomentosa ; petiolus circiter 0·5–1·5 cm. longus ; stipulae 2–3 mm. longae, lineari-lanceolatae, inferne tantum petiolo adnatae, et cum eo vaginam brevissimam formantes ; lamina herbacea, ambitu triangulari-semicircularis, circiter 5 mm. longa, 7 mm. lata, ad basin tripartita, venis palmatis instructa, segmentis ambitu rotundato-obcuneatis ad medium trifidis iterum multilobis, lobis obovatis obtusis vel subacutis. *Flores* prope basin petioli insidentes, sessiles. *Calyx* circiter 3 mm. longus, lobis 2 mm. longis triangulari-acutis, subglaber vel sparse hirsutus. *Corolla* 2·5 mm. longa ; stamina in caput rotundum aggregata. *Carpella* 1·75 mm. longa, erostrata, dorso minute stellata.

CHILE. Prov. Tacna : Cordillera Volcan Tacora ; Ancara, 4300 m., *Werdermann* 1121.



Left.—*Nototriche sarmentosa* A. W. Hill (×3).
Right.—*Nototriche nana* A. W. Hill (×3).

Nototriche sarmentosa *A. W. Hill*; species *N. nanae* A. W. Hill affinis, sed planta maxima, ramis crassioribus, foliis majoribus circiter ad medium trifidis, carpellis minute rostratis differt.

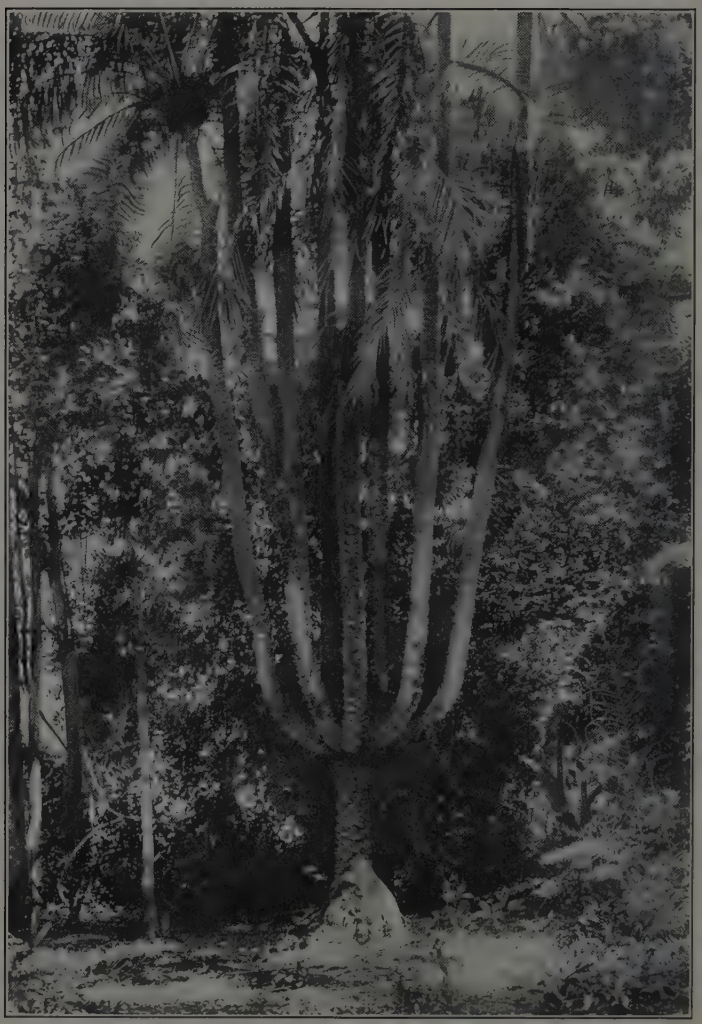
Herba annua, prostrata, sarmentosa, ramis axillaribus 4–7 cm. longis solo adpressis. *Folia* arcte aggregata, rosulata, cinereo-viridia, uti rami et petioli pilis stellatis laxis sparse instructa; petiolus 0·8–1·1 cm. longus; stipulae usque ad medium petioli adnatae, lineari-lanceolatae, sparse stellatae; lamina herbacea, ambitu semicircularis, 4-5 mm. longa, 0·7–1·3 cm. lata, minute velutina, plus minusve ad medium triloba, lobo medio maximo, lobis iterum subtrilobatis, lobulis ipsis 4–7-lobulatis, lobulis ultimis crenatis. *Flores* ad medium petioli insidentes, sessiles. *Calyx* 5 mm. longus, ad medium 5-lobus, pilis stellatis instructus, lobis triangulari-acutis. *Corolla* circiter 2–2·5 mm. longa, tubo 0·5 mm. longo; stamina pauca, in caput rotundum coartata. *Carpella* 1·75 mm. longa, minute bi-rostrata, rostris 0·1 mm. longis apice pilis stellatis minutis instructis.

Chile. Prov. Tacna: Cordillera Volcan Tacora; Ancara, 4300 m., *Werdermann* 1123.

Notes on Malvastrum.

Malvastrum nubigena *Baker fil.*—In looking through the sheets of *Malvastrum*, in connection with the Werdermann collection, I find that *Malvastrum Buchtieni* Pax, described in Fedde's Repertorium, vii (1909), p. 243 (Plantae novae bolivianae, iii, Lingelsheim, Pax and Winkler), is identical with *Malvastrum nubigena* Baker fil., described in the year 1891 in Journ. Bot. xxix, p. 172.—See also amplified description with synonymy in A. W. Hill, Journ. Linn. Soc., Bot. xxxix, October 1909, p. 223.—The specimens and descriptions agree very closely and the locality is the same for both. *M. nubigena* Baker fil., being the older name, has precedence of *M. Buchtieni* Pax. A. W. H.

PLATE I



Branching in the African Oil Palm.

To face page 21.]

Malvastrum coccineum (*Pursh*) *A. Gray*. The new combination *Nototriche coccinea* (Pursh) Nieuwl. & Lunell in Amer. Midl. Nat. iv, 476 (1916), is invalid for two reasons. In the first place it duplicates the already existing valid name *Nototriche coccinea* A. W. Hill in Engl. Jahrb. xxxvii, 583 (1906) ; and in the second place the authors have rejected the generic name *Malvastrum* A. Gray in favour of *Nototriche* Turcz. (sensu ampl.), on the ground that it was unsuitable or badly formed—" Name unfit as built on *Malva*." As this is contrary to the International Rules, Art. 50—" No one is authorised to reject, change or modify a name (or combination of names) because it is badly chosen, or disagreeable, or another is preferable " —the combination *Nototriche coccinea* is a nomen abortivum apart from the existence of the earlier *Nototriche coccinea* A. W. Hill.

M. L. G.

III.—BRANCHING IN THE AFRICAN OIL PALM. M. T. Dawe.

In a recent journey in the Colony of Sierra Leone my attention was drawn to a very remarkable case of branching in the Oil Palm (*Elaeis guineensis*).

The palm is growing in a clump of bush on the estate of Mr. M. S. Brown, situated at Pa Lokko near Waterloo. The bush surrounding it has evidently been preserved from early days in protection of this extraordinary palm. It is said that it was regarded as sacred by the people of the Koya country, and that in days gone by they actually made human sacrifices to the tree.

It is not surprising that such a remarkable and abnormal case of branching of an Oil Palm should be regarded by the natives as a very extraordinary abnormality, and looked upon by them as possessing some fetish significance. That the people of the present generation regard it with awe and fear is evident, as the owner informed me that he had the greatest difficulty in getting the natives to clear away the underscrub and bush in the immediate vicinity of the palm.

In the opinion of the older inhabitants this palm is over one hundred years old, and the owner informs me that it had never been known to bear any fruit. This further abnormal character may be an added reason for the natives regarding it as a fetish palm.

As will be seen from the accompanying photograph, the palm branches at the height of six feet or so, and sends up from a kind of fasciated growth eight normal-size branches which attain the usual height. A small anthill will be seen encrusted to the base of the main stem. A further remarkable feature is that two of the branches have also branched. One of these is on the extreme left of the photograph, the other is in the middle (top). It is presumed, in the case of the left branch, that one of the branchlets has been broken off by wind, and not that a new branch has been formed subsequent to the breaking off of a main branch. I assume this, as a large number

of palms are decapitated in times of scarcity for the sake of the "cabbage," which is eaten, and I have never seen a case of a new growth forming on a decapitated palm.

Branching in palms is only habitual in the case of two species of *Hyphaene*, *H. thebaica*, the Doum Palm of Northern Africa, and also *H. Petersiana*. It is occasional in several other genera such as *Areca*, *Borassus*, *Oreodoxa*, *Phoenix*, *Cocos*, etc., but I cannot trace any record in literature of a case of branching in the Oil Palm. Sir Daniel Morris, in his interesting paper, "On the Phenomena concerned in the Production of Forked and Branched Palms" (Journ. Linn. Soc. xxix, 297) says, "In Coccineae the only branched specimens so far recorded belong to the single species *Cocos nucifera*. In the other genera of the tribe, for instance *Elaeis*, are included palms occupying the area of nearly half a continent, and yet not a single instance of branching appears to be recorded amongst them."

In many cases branching or forking in palms is due to some injury to, or the destruction of, the apical bud or growing point, which causes the development of axillary buds in the crown of the palm below the terminal bud; such buds lengthen out and become branches. It is, however, difficult to accept that the cases of branching represented in the palm here shown are each due to accidental causes, since the repeated branching would seem to indicate a physiological character.

It would be interesting to learn if any other cases of branching in the Oil Palm have been met with in any other part of West Africa or elsewhere.

IV.—TROPICAL AFRICAN PLANTS: II.* J. Hutchinson and J. M. Dalziel.

Aristolochiaceae.

The genus *Aristolochia*, as at present defined, comprises a large group of species with considerable diversity of floral structure. A comprehensive study of the whole genus would probably show that a number of distinct genera could be established. In Africa, at any rate, and especially in West Africa, we have detected a group which is of very great interest from a phylogenetic point of view in that it apparently points to the origin of the genus and is evidently an ancestral type. These species, for which we have proposed the name *Pararistolochia* in the Flora of West Tropical Africa (pt. 1, p. 75), are characterised by having an actinomorphic more or less equally 3-lobed perianth-limb and a remarkable cucumber-shaped indehiscent fruit which is longitudinally ribbed and traversely locellate. This type of fruit is very different from the ordinary obovoid capsule of *Aristolochia* proper. We have seen fruits of only a small proportion of the species enumerated below, and some of them are very imperfectly known, so that considerably more collecting is necessary before an adequate account of the genus can be given.

*Continued from *K.B.* 1927, p. 157.

Pararistolochia *Hutch. et J. M. Dalz.* ; genus novum ab *Aristolochia* Linn. perianthii limbo regulariter 3-lobato, fructu elongato indehiscente transverse locellato lignoso valde costato differt.

Frutices volubiles. *Folia* alterna, petiolata, integerrima vel trilobata, basi rotundata vel cordata. *Perianthium* plerumque oblique tubulosum, basi globoso-inflatum, superne leviter sensim ampliatum, limbo subactinomorpho regulariter triangulari-trilobato, rarius lobulis intermediis. *Stamina* etcetera *Aristolochiae*, sed fructus elongatus indehiscens valde costatus lignosus transverse locellatus, seminibus planis duris.

Clavis specierum.

Perianthii lobi lobulis intermediis instructi ; folia non visa...1. *ju-ju.*
Perianthii lobi lobulis intermediis haud instructi :
Folia basi rotundata, haud vel leviter cordata :
Perianthii lobi 10–12 cm. longi.....2. *Soyauxiana.*
Perianthii lobi usque ad 6 cm. longi :
Perianthii lobi 4–6 cm. longi :
Perianthii tubus circiter 6–7 cm. longus, basi conspicue inflatus :
Perianthii lobi 5–8 cm. longi :
Perianthii lobi haud caudati :
Perianthii lobi aequales, basi late ovati.....3. *Flos-avis.*
Perianthii lobi inaequales, lanceolati.....4. *Staudtii.*
Perianthii lobi longe caudati.....5. *Preussii.*
Perianthii lobi 2–2·5 cm. longi.....6. *Zenkeri.*
Perianthii tubus circiter 4 cm. longus, basi leviter inflatus, lobis 3–4 cm. longis.....7. *tribrachiata.*
Perianthii lobi circiter 1 cm. longi ; flores racemosi :
Ramuli floriferi satis robusti ; perianthii tubi pars inflata ambitu elliptica, circiter 1 cm. longa, lobis triangularibus 8. *leonensis.*
Ramuli floriferi graciles ; perianthii tubi pars inflata ambitu subglobosa, circiter 0·7 cm. longa, lobis lineari-subulatis 9. *ceropegioides.*
Folia basi profunde cordata :
Folia plus minusve trilobata ; perianthii tubus circiter 8 cm. longus :
Folia distincte trilobata, sino basale angusto.....10. *triactina.*
Folia undulate lobata, sino basale lato.....11. *Schweinfurthii.*
Folia haud lobata ; perianthii tubus circiter 18 cm. longus..... 12. *Goldieana.*

1. **Pararistolochia ju-ju** *Hutch. et J. M. Dalz.*, comb. nov. *Aristolochia ju-ju* S. Moore in Journ. Bot. 1920 : 269.
Nigeria : Southern Provinces ; Degema, *Talbot* 3766.

2. **Pararistolochia Soyauxiana** *Hutch. et J. M. Dalz.*, comb. nov. *Aristolochia Soyauxiana* Oliv. in Hook. Ic. Pl. t. 1410 (1883).

Gabon : Sibange Farm, Nov., *Soyaux* 317 (type). Loango, Dec., *Soyaux* 182.

3. **Pararistolochia Flos-avis** *Hutch. et J. M. Dalz.*, comb. nov. *Aristolochia Flos-avis* A. Chev. in Journ. de Bot., 1909 : 129. *A. Tessmannii* Engl. Bot. Jahrb. 46 : 413 (1911).

Sierra Leone : Commendi-Gengaru Road, Nov., *Burbridge* 622. Ivory Coast : Guidéko, May, *Chevalier* 16434 (type) ; between Sampleu and Genhoué, in the forest, Apr., *Chevalier* 21145. Gold Coast : without locality, *Gould*. Nigeria : Southern Provinces ; Oban, *Talbot* 213. Cameroons : Bipinde, *Zenker* 2261, 2792, 3484 ; Bitye, *Bates* 1250. Spanish Guinea : Bebai, Dec., *Tessman* 717.

4. **Pararistolochia Staudtii** *Hutch. et J. M. Dalz.*, comb. nov. *Aristolochia Staudtii* Engl. Bot. Jahrb. 24 : 491 (1897).

Cameroons : Lolodorf, in damp shady places rich in humus in the forest, Mar., *Staudt* 186.

5. **Pararistolochia Preussii** *Hutch. et J. M. Dalz.*, comb. nov. *Aristolochia Preussii* Engl. Bot. Jahrb. 24 : 492 (1897).

Nigeria : Southern Provinces ; Barombi, between the station and Kumba, Apr., *Preuss* 108.

6. **Pararistolochia Zenkeri** *Hutch. et J. M. Dalz.*, comb. nov. *Aristolochia Zenkeri* Engl. Bot. Jahrb. 24 : 490 (1897).

Cameroons : Bipinde, in shady forest, Dec., *Zenker* 1226 (type), 2056.

7. **Pararistolochia tribrachiata** *Hutch. et J. M. Dalz.*, comb. nov. *Aristolochia tribrachiata* S. Moore in Cat. Talb. Nig. Pl. 92 (1913).

Nigeria : Southern Provinces ; Oban, *Talbot* 213, 1542 (type).

8. **Pararistolochia leonensis** *Hutch. et J. M. Dalz.*, comb. nov. *Aristolochia leonensis* Mast. in Journ. Linn. Soc. 30 : 95 (1894).

Sierra Leone : near Kassa, 1100 m., Mar., *Scott Elliot* 5062 (type) ; near Berria, Falaba, Mar., *Scott Elliot* 5401.

9. **Pararistolochia ceropegioides** *Hutch. et J. M. Dalz.*, comb. nov. *Aristolochia ceropegioides* S. Moore in Journ. Bot. 58 : 269 (1920).

Cameroons : Bitye, *Bates* 1235 (type), 1446 ; Jaunde, Jan., *Mildbraed* 7848.

10. **Pararistolochia triactina** *Hutch. et J. M. Dalz.*, comb. nov. *Aristolochia triactina* Hook. f. in Trans. Linn. Soc. 25 : 186 (1865).

Nigeria : Southern Provinces ; Lagos, *Maloney* 18 ; *Dalziel* 1076 ; Itu, Apr., *Holland* 26. Gabon : Corisco Bay, *Mann* 1851 (type).

11. **Pararistolochia Schweinfurthii** *Hutch. et J. M. Dalz.*, comb. nov. *Aristolochia Schweinfurthii* Engl. Bot. Jahrb. 24 : 492 (1897).

Eastern Sudan : Munza, Monbuttu-land, Apr., *Schweinfurth* 3507 (type) ; Yei River, Lado district, *Sillitoe* 354. Uganda : Entebbe,

Mahon. Mukono, Oct., *Dummer* 334. Angola : Quilemda, near Monte de légre, Nov., *Gossweiler* 4884.

According to Mahon, this is common in a small area on the lake shore near Entebbe ; it is a vigorous climber with numerous flowers on the oldest stems.

12. **Pararistolochia Goldieana** *Hutch. et J. M. Dalz.*, comb. nov. *Aristolochia Goldieana* Hook. f. in Trans. Linn. Soc. 25 : 185, t. 14 (1865).

Sierra Leone : Port Lokko, Apr., *Scott Elliott* 5747 ; Pendumbu, Apr., *Scott Elliot* 5682. Nigeria : Northern Provinces ; near Lokoja, *Elliott* 250 : Southern Provinces ; Old Calabar, *Thomson* (type) ; Oban, *Talbot* 2340 ; Elugu, *Barter* 3427. Fernando Po, May, *Mann* 391. Cameroons : Dengdeng, *Mildbraed* 8812.

CAPPARIDACEAE.

Capparis biloba *Hutch. et J. M. Dalz.*, sp. nov. ; affinis *C. erythrocarpae* Isert, sed foliis utrinque rotundatis apice emarginatis, petalis apice profunde bilobatis, ovario haud costato differt.

Rami aculeati, minute ferrugineo-puberuli, aculeis recurvatis latere complanatis circiter 5 mm. longis. *Folia* late elliptica, utrinque rotundata, apice emarginata, 4·5–6 cm. longa, 2·5–3·5 cm. lata, glabra, nervis lateralibus utrinsecus 5–6 patulis utrinque prominulis ; petioli 5–6 mm. longi, puberuli. *Flores* pauci, terminales, corymbosi, bracteis aculeatis, pedicellis usque ad 2 cm. longis minute puberulis. *Sepala* 1–1·5 cm. longa, late elliptica, marginibus tenuibus glabratis, extra puberula. *Petala* profunde biloba, late obovata, circiter 2·5 cm. longa, intra arachnoideo-pubescentia. *Filamenta* rubescentia. *Ovarium* longe stipitatum, ovoideum, glabrum.

Gold Coast : Assuantsi, Sept., flowers pink and white, *Dalziel* 160.

Ritchiea obanensis *Hutch. et J. M. Dalz.*, sp. nov. ; affinis *R. oreophilae* Gilg et Benedict, sed inflorescentiis multifloris differt.

Rami crassi, lenticellis numerosis notati. *Folia* magna, trifoliolata ; foliola late elliptica vel ovato-elliptica, acute acuminata, basi rotundata vel brevissime cuneata, usque ad 30 cm. longa et 12 cm. lata, glabra, nervis lateralibus utrinsecus 6–8 infra valde prominentibus marginem versus prominenter conjunctis, nervis tertiariis paucis gracilibus ; petioli usque ad 15 cm. longi, supra plani, petiolulis 0·5–1 cm. longis. *Inflorescentiae* ad apices ramulorum aggregatae, multiflorae, usque ad 15 cm. longae ; bracteae persistentes, subulatae, induratae, 1·5 mm. longae ; pedicelli 1·5 cm. longi, puberuli. *Sepala* obovato-elliptica, acuminata, 2 cm. longa, marginibus puberulis. *Petala* lineari-filiformia, sepalis duplo longiora, marginibus corrugato-undulatissimis. *Stamina* numerosa ; antherae 3 mm. longae. *Ovarium* longe stipitatum, oblongum, glabrum. *Fructus* immaturus obtuse longitudinaliter costatus, verruculosus.

Nigeria : Southern Provinces ; Oban, *Talbot* 58 (type). Fernando Po, *Mann*.

CRUCIFERAE.

Nasturtium benuense *Hutch. et J. M. Dalz.*, sp. nov.; affinis *N. humifuso* Guill. et Perr., sed foliis brevioribus, inflorescentiis in ramis foliatis ortis, fructibus oblongo-lanceolatis circiter 5 mm. longis stylo brevissimo differt.

Herba parva usque ad 6 cm. alta; rami glabri. *Folia* pinnata, segmentis alternatis ovatis usque ad 1 cm. longis et 0·8 cm. latis obtuse dentatis glabris nervis lateralibus utrinsecus 3–4. *Racemi* breviter pedunculati, 2·5 cm. longi; pedicelli 0·75 mm. longi, patuli. *Sepala* 1 mm. longa, glabra. *Petala* parva. *Ovarium* ellipsoideum, glabrum, stigmata sessile disciforme.

Nigeria: Northern Provinces; Abinsi, Apr., in stream beds of the Benue river, *Dalziel* 746.

VIOLACEAE.

Rinorea djalonensis *A. Chev.* Explor. Bot. Afr. Occ. Franç. 34, nomen; affinis *R. arenicolae* M. Brandt, sed connectivo integro, ramulis costa media et nervis lateralibus setoso-pilosis, foliis obovato-ellipticis subabrupte acute acuminatis basi obtusis vel subacutis 20 cm. longis vel ultra 8–10 cm. latis crasse serratis differt.

French Guinea: Labé, Mar., *Chevalier* 12394: between Ditinn and Diaguissa, Apr., *Chevalier* 12845; Kindia, Mar., *Chevalier* 13105; from Kala to Diaguissa, 1200–1400 m., Apr., *Chevalier* 13552; Futa-Jallon, *Chevalier* 18742 (type).

Hybanthus thesiifolius *Hutch. et J. M. Dalz.*, comb. nov. *Ionidium thesiifolium* DC. Prodr. 1.; 309 (1824). *I. thesiifolium* var. *chenopodioides* Guill. et Perr. Tent. Fl. Seneg. 35. *I. enneaspermum* Oliv. Fl. Trop. Afr. 1: 105, partim, non Vent. *Viola guineensis* Schum. et Thonn. Beskr. Guien. Pl. 133 (1827).

Senegal: St. Louis, *Heudelot*. Walo, etc., *Heudelot*; *Roger* 146. Gold Coast: Accra, *Moloney*; *Brown* 409; *Deighton* 570; Achimota, *Irvine* 129.

POLYGALACEAE.

Carpolobia glabrescens *Hutch. et J. M. Dalz.*, sp. nov.; a *C. lutea* G. Don floribus majoribus, sepalis latioribus ovatis vel ovato-lanceolatis leviter ciliatis differt.

Frutex circiter 3 m. altus; ramuli leviter flexuosi, primum breviter pubescentes demum glabrescentes. *Folia* oblonga vel oblongo-elliptica, utrinque triangulari-attenuata, apice acute subcaudato-acuminata, 6–11 cm. longa, 2·5–4 cm. lata, integra, fere membranacea, glabra vel fere glabra, nervis lateralibus utrinsecus 4–6; petioli circiter 2 mm. longi, breviter pubescentes. *Racemi* axillares, 3–4-flori; pedicelli 5 mm. longi, minute puberuli; bracteae oblongo-subulatae, breviter pubescentes, 1·5–2 mm. longae. *Sepala* subaequalia, ovata ad ovato-lanceolata, apice rotundata, usque ad 8 mm. longa, ciliolata. *Petala* 1·5 cm. longa. *Stamina* petalis breviora. *Ovarium* glabrum. *Fructus* circiter 1·5 cm. diametro. *Semina* ellipsoidea, circiter 1 cm. longa, dense aureo-villosa.

Fernando Po : *Mann* 78 (type). Nigeria : Southern Provinces, Johann-Albrechtshöhe, *Staudt* 460. Cameroons : Bipinde, *Zenker* 1016, 1106, 1588, 2787, 2869, 3016a, 3656, 3842, 4443, 4489. Gabon : Sibange Farm, *Soyaux* 304. Angola ; Golungo Alto, *Welwitsch* 996.

The plants here described have been previously named *C. alba* G. Don and *C. lutea* G. Don, and will be found under these names in herbaria. They may represent a hybrid of these two species, which are both rather variable.

ELATINACEAE.

Bergia guineensis *Hutch. et J. M. Dalz.*, sp. nov. ; affinis *B. suffruticosae* Fenzl., sed sepalis ovato-lanceolatis sensim acuminatis ad apicem pubescentibus, antheris haud mucronatis differt. *Bergia suffruticosa* Oliv. Fl. Trop. Afr. 1 : 153, partim, non Fenzl. *Talinum crassifolium* A. Chev. Explor. Bot. Afr. Occ. Franç. 48, non Willd. *Lancretia suffruticosa* Guill. et Perr. Tent. Fl. Seneg. 108, non Del.

Suffrutex ericoideus, ramis patulis vel decumbentibus interdum elongatis molliter et albido-pubescentibus. *Folia* opposita vel verticillata, majora elliptica, breviter petiolata, basi plus minusve cuneata, usque ad 3 cm. longa et 1·3 cm. lata, plerumque minora, crebre serrata, utrinque scabrido-pubescentia, nervis lateralibus utrinsecus 4–5 prominulis ; stipulae lineari-lanceolatae, foliaceae, dentatae, usque ad 0·5 cm. longae. *Flores* axillares, glomerati ; pedicelli usque ad 0·5 cm. longi, pubescentes. *Sepala* ovato-lanceolata, longe et acute acuminata, 4–5 mm. longa, 2 mm. lata, dorso crasse carinata et ad apicem pubescentia, margine membranaceo. *Petala* obovata, acuta, sepalis paulo longiora, 3-nervia, 5 mm. longa. *Filamenta* 3 mm. longa, basi complanata ; antherae 1 mm. longae, haud mucronatae. *Ovarium* ovoideum, 2·5 mm. longum ; styli 5, fere 2 mm. longi.

Senegal : *Roger* (type) ; *Heudelot*. French Sudan : Niala, *Chevalier* 1134. Ivory Coast : near Assikasso, *Chevalier* 22577. Nigeria : Northern Provinces ; Kuka, *Vogel* 14 ; Katagum, very common in bush and waste places, *Dalziel* 190 ; Sokoto, *Moiser* 192, 255.

MOLLUGINACEAE.

Mollugo Chevalieri *Hutch. et J. M. Dalz.*, sp. nov. ; affinis *M. Cervianae* Seringe, sed foliis caulinis anguste oblanceolatis, floribus glomeratis, glomerulis sessilibus vel breviter pedunculatis, seminibus nigris turgidis.

Herba multe ramosa, ramis flexuosis stramineis angulatis glabris. *Folia* radicalia obovato-spatulata, usque ad 1·5 cm. longa, mox decidua, caulina anguste oblanceolata, usque ad 4 mm. lata, 1-nervia, glabra. *Pedicelli* 2–3 mm. longi, glabri. *Sepala* ovato-elliptica, margine hyalina, 2 mm. longa, glabra. *Capsula* membranacea, ovoideo-globosa, 2·5 mm. longa. *Semina* laevia, nigra, nitida, turgida, 0·75 mm. lata.

French Sudan : San, banks of the Bani river, June, *Chevalier* 1080.

Afrobrunnichia *Hutch. et J. M. Dalz.*; genus novum a *Brunnichia* Banks pedicellis fructiferis utrinsecus ala lata instructis, calycis lobis vix imbricatis, nuce turgido differt.

Frutex ramulorum apicibus tendriliformibus scandens. *Folia* alterna, elliptica, acuminata, petiolo basi angustissime amplexicauli, ocrea obsoleta. *Flores* racemoso-paniculati, hermaphroditi, parvi; pedicelli per anthesin anguste complanati, apicem versus articulati, fructiferi supra articulationem utrinsecus late alati et elongati. *Calyx* basi breviter tubulosus, lobis 5 anguste lanceolatis conniventibus. *Stamina* plerumque 8, e perianthii lobis longe exserta, filamentis filiformibus; antherae late ellipsoideae. *Ovarium* turgidum; styli 3, filiformes; ovulum e funiculo longo pendulum. *Nux* perianthio inclusa, ovoidea, cuspidata, turgida sed lineis 3 longitudinalibus leviter impressis notata. *Semen* ambitu nuce conforme, profunde longitudinaliter trisulcatum, albumine irregulariter ruminato.

Clavis specierum.

Ramuli teretes, glabri; cirrhi ramulos laterales foliates terminantes ..... *erecta.*
Ramuli angulares, rubiginoso-puberuli; cirrhi axillares, haud vel vix foliati..... *africana.*

Afrobrunnichia erecta *Hutch. et J. M. Dalz.*, comb. nov. *Brunnichia erecta* Aschers. in Jahrb. Königl. Bot. Gart. Berlin 1; 334 (1881); Baker and Wright in Dyer Fl. Trop. Afr. 6, 1: 119. *B. africana* Welw. var. *glabra* Dammer in Engl. Bot. Jahrb. 26: 357. *B. africana* Stapf in Johnston, Liberia 2: 644, non. Welw.

Liberia: near Kakatown, *Whyte*. Ivory Coast: Bouroukrou, *Chevalier* 16692, 16803; Makougnié, *Chevalier* 17015; valley of the Agniéby, *Chevalier* 17137; basin of the Lower Cavally, *Chevalier* 19313; Morénou, *Chevalier* 22489. Gold Coast: Axim, *Burton*; Bompata, *Dalziel* 112. Nigeria: Southern Provinces; Ijan, fr. Jan., *Millen* 140; Oban, *Talbot* 1497. Cameroons: Duala, *Dalziel* 8152; Bipinde, *Zenker* 1125, 2031, 2272, 2272a, 2823, 3490; Bitye, near the river Ja, *Bates* 1783; between Ediki and Bakunda, *Winkler* 1046. Gabon: Sibange Farm, *Soyaux* 152 (type), 382; Libreville, *Klaine* 503. Belgian Congo: Mobwasa, *Vermoesen* 250.

Afrobrunnichia africana *Hutch. et J. M. Dalz.*, comb. nov. *Brunnichia africana* Welw. in Trans. Linn. Soc. 27: 61 (1869); Oliv. in Hook. Ic. Pl. 14; 21, t. 1328; Dammer in Engl. Bot. Jahrb. 26: 357; Hiern in Cat. Afr. Pl. Welw. 1: 905; Baker and Wright in Dyer Fl. Trop. Afr. 6, 1: 119.

Angola: Golungo Alto District; in forests near streams among mountains in Sobato de Bumba and at Capopa waterfall near Sange, *Welwitsch* 1754 (type).

Chenolea muricata *Hutch. et J. M. Dalz.*, comb. nov. *Kochia muricata* Schrad. Neues Journ. 3 : 86 (1809). *Echinopsilon muricatus* Mog. in Ann. Sc. Nat. Ser. ii. 2 : 127 (1834) ; A. Chev. Expl. Bot. Afr. Occ. Franç. 533.

Mauritania : Dhreine, *Charles* 28877.

Achyranthes Talbotii *Hutch. et J. M. Dalz.*, sp. nov. ; inter species africanas foliis linearibus glabris spicis gracillimis valde distincta.

Caules glabri, internodiis 2–3 cm. longis. *Folia* opposita, linearia vel anguste lineari-lanceolata, acuta, basi sensim angustata, 5–7 cm. longa, 3–8 mm. lata, glabra, nervis lateralibus obscuris ; petioli usque ad 0·5 cm. longi. *Spicae* terminales vel ramulos breves axillares terminantes, gracillimae, usque ad 15 cm. longae ; axis subquadrangularis, pubescens ; bracteae recurvae vel reflexae, ovato-lanceolatae, acutissime acuminatae, 2 mm. longae, hyalinae. *Flores* mox abrupte reflexi, 3·5–4 mm. longi. *Bracteolae* e basi orbiculari hyalino subulatae, circiter 2 mm. longae. *Calycis* segmenta anguste lanceolata, acuta, viridia. *Stylus* 0·75 mm. longus.

Nigeria : Southern Provinces ; Oban, *Talbot* (sine numero in Herb. Kew.).

Hugonia Chevalieri *Hutch. et J. M. Dalz.*, sp. nov. ; affinis *H. spicatae* Oliv., sed foliis acutis acuminatis brevioribus, stipulis extra lanatis, ovario glabro differt.

Ramuli novelli molliter lanato-tomentosi. *Folia* elliptica vel oblongo-elliptica, basi rotundata, apice acute et subabrupte acuminata, 9–14 cm. longa, 5–7 cm. lata, grosse crenato-dentata, supra demum fere glabra, infra molliter lanata ; nervi laterales utrinsecus circiter 16, a costa sub angulo latissimo abeuntes, nervis tertiariis obscuris ; petioli circiter 1 cm. longi, lanati ; stipulae per anthesin persistentes, pinnatisectae, circiter 1 cm. longae, segmentis linearibus extra breviter lanatis. *Flores* axillares, subsessiles. *Sepala* ovato-lanceolata, subacute acuminata, extra lanato-tomentosa, 1 cm. longa. *Petala* anguste obovata, glabra, circiter 1·5–1·8 cm. longa, 6 mm. lata. *Ovarium* glabrum. *Fructus* obovoideus, 2 cm. longus, nitens, glaber.

Ivory Coast : basin of the Sassandra, at Guideko, May, 1907, *Chevalier* 16371.

Ochthocosmus Chippii *Sprague et Hutch.* in Chipp List Gold Coast Trees, etc., 11, nomen ; affinis *O. calothyrso* Hutch. et J. M. Dalz., comb. nov. (*Phyllocosmo calothyrso* Mildbr.), sed foliis minus dentatis, pedicellis multo brevioribus differt.

Frutex usque ad 3 m. altus. *Folia* anguste obovato-oblanceolata, apice rotundata, basi sensim angustata, 7–18 cm. longa, 2·5–6 cm. lata, distanter dentata, glabra ; nervi laterales utrinsecus circiter

10, supra leviter impressi, infra prominuli marginem versus evanidi; petioli basi incrassati et transverse rugosi, usque ad 1·5 cm. longi. *Paniculae* terminales, laxiflorae, circiter 15 cm. longae; pedicelli 2–5 mm. longi, graciles. *Flores* albi vel rosei. *Sepala* suborbicularia, 2 mm. diametro, margine minute denticulata. *Petala* orbicularia, 4 mm. diametro, apice emarginata. *Stylus* 5 mm. longus. *Fructus* non visus.

Gold Coast: Axim, Apr., *Chipp* 424 (type); Princestown, *Chipp* 171.

GERANIACEAE.

Geranium brevipes *Hutch. et J. M. Dalz.*, sp. nov.; affinis *G. favoso* Hochst., sed foliis solum ad medium lobatis, carpellis fructiferis inconspicue transverse lineatis nec tuberculatis differt.

Herba usque ad 1·25 m. alta; caules patule pilosi, pilis apice glandulosis, internodia elongata. *Folia* ambitu suborbicularia, basi late triangulari cordata, ad medium digitate 5-lobata, lobis irregulariter et profunde dentatis, infra tenuiter pilosa; petioli usque ad 4 cm. longi; stipulae subulato-lanceolatae; circiter 3–4 mm. longae, pilosae. *Flores* solitarii vel in pedunculo brevigeminati; pedicelli usque ad 1·5 cm. longi, graciles, pilosi. *Sepala* anguste ovata, acuminata, in nervis pilosa, 5 mm. longa. *Petala* late obovata, fere 1 cm. longa, purpurascentia. *Carpella* fructifera inconspicue transverse lineata.

Cameroons Mt.: 2250 m., Dec., *Mann* 1261.

PITTOSPORACEAE.

Pittosporum Dalzielii *Hutch.*, sp. nov.; affinis *P. abyssinico* Hochst., sed foliis apice longe acuminatis differt.

Arbor; ramuli teretes, glabri. *Folia* obovato-oblanceolata, acute et sensim acuminata, supra medium ad basin longe attenuata, 8–15 cm. longa, 3–5 cm. lata, obscure reticulata, glabra; nervi laterales utrinsecus 8–10, graciles, infra prominuli, inter costam et marginem bifurcati et evanidi; petioli 2–2·5 cm. longi, straminei, anguste alati. *Flores* non visi. *Fructus* valvae fere orbiculares, 5–7 mm. longae, utrinque transverse rugosae, stylo diviso persistenti brevi stigmate capitato coronatae. *Semina* ambitu suborbicularia, uno latere plana, nigra, circiter 5 mm. diametro.

Nigeria: Northern Provinces; R. Koriga, fr. Feb., *Dalziel* 417.

As we know at present only a fruiting example of this apparently distinct species, the description given above should be regarded as tentative.

FLACOURTIACEAE.

Dasylepis assinensis *A. Chev.* Expl. Bot. Afr. Occ. Franç. 39, nomen; affinis *D. brevipedicellatae* Chipp, sed foliis dentatis floribus subsessilibus differt.

Frutex? *Folia* oblongo-elliptica, basi rotundata, apice obtuse et longe acuminata, circiter 12 cm. longa, 4–5 cm. lata, tenuia, dentata, glabra; nervi laterales utrinsecus 5, utrinque prominentes,

intra marginem conjuncti, inter nervos laxe et inconspicue venosi ; petioli 0·5 cm. longi. *Flores* subspicati. *Sepala* late elliptica, circiter 5 mm. longa, glabra. *Antherae* 2 mm. longae.

Ivory Coast : Assinie, Apr., *Chevalier* 17872.

Scottellia coriacea *A. Chev.* Expl. Bot. Afr. Occ. Franç. 39, nomen ; affinis *S. kamerunensi* Gilg, sed foliis basi cuneatis vel obtusis, petiolo longiori differt.

Arbor circiter 22 m. alta, cortice rugoso cinereo ligno pallide flavo ; ramuli teretes, glabri. *Folia* elliptica vel elliptico-obovata, obtuse et subcaudato-acuminata, basi breviter cuneata, 5–9 cm. longa, 3·5–4·5 cm. lata, coriacea, nitida, superne obscure dentata ; nervi laterales utrinsecus circiter 5, infra prominentes et intra marginem conjuncti et ramosi, inter nervos conspicue reticulati ; petioli 1–1·5 cm. longi, apice leviter incrassati et transverse rugosi. *Flores* non visi. *Racemi* fructiferi axillares, fasciculati, usque ad 8 cm. longi ; pedicelli 1 cm. longi, basi articulati, minute pubescentes. *Fructus* 1-spermus, oblique globosus vel ellipsoideus, 7 mm. diametro, crebre rugulosus. *Semina* ambitu fructui conformia, rugulosa, brunnea.

Ivory Coast : Alépé, fr. Mar., *Chevalier* 16231 (type) ; Yapo, *Chevalier* 22315.

Dioncophyllum Dawei *Hutch. et J. M. Dalz.*, sp. nov. ; foliis elongatis nervis lateralibus numerosissimis, seminibus crassis disciformibus valde distincta.

Frutex vel scandens ; ramuli ultimi satis crassi, rubiginoso-tomentelli. *Folia* lineari-oblonga, basi subacuta, usque ad 27 cm. longa et 5·5 cm. lata, chartacea, glabra, nervis lateralibus numerosissimus utrinque prominulis a costa sub angulo fere recto abeuntibus; costa utrinque prominula, supra apicem laminae longe producta et bifurcata, segmentis valde recurvatis tendriliformibus ; folia inflorescentiae elliptica ceteribus multo brevioria ; petioli circiter 1 cm. longi, puberuli, complanati. *Racemi* leviter supra-axillares, ubique rubinoso-tomentelli ; bracteae foliaceae, ovato-ellipticae, usque ad 2 cm. longae, pedicelli 1 cm. longi. *Sepala* lanceolata, acuta, 1–1·3 cm. longa, puberula. *Petala* alba, contorta, obovata, sepalis paulo longiora, glabra. *Stamina* 10, inaequalia. *Capsula* non visa. *Semina* crassa, magna, orbicularia, depressa, anguste alata, circiter 9 cm. diametro.

Sierra Leone : Pujehun District ; Mano Bonjema, in sandy soil, fl. Feb., *M. T. Dawe* 466 (type) ; common in the Mano Salija to Juring area, in sand, *F. C. Deighton* 332.

According to Deighton this is a shrub which becomes a climber where other vegetation is available for support. The seeds are very remarkable, and at first sight resemble hard discoid fruits.

Dioncophyllum peltatum *Hutch. et J. M. Dalz.*, sp. nov. ; foliis oblanceolatis basi longe attenuatis, racemis brevibus, seminibus tenuibus latissime alatis distincta.

Frutex scandens usque ad 20 m. longus; ramuli ultimi teretes, glabri. *Folia* oblanceolata, basi longe attenuata, usque ad 15 cm. longa et 3·5 cm. lata, subcoriacea, glabra, nervis lateralibus vix distinctis; costa supra valde prominens, interdum supra apicem laminae producta et bifurcata, segmentis valde recurvatis tendriliformibus demum induratis; petioli circiter 1 cm. longi, pulvinati, minute lepidoto-rubiginoso-puberuli. *Racemi* fructiferi tantum visi, foliis multo breviores; bracteae parvae, breviter subulato-lanceolatae, circiter 2 mm. longae; pedicelli usque ad 3 cm. longi. *Calyx* breviter cupulatus, triangulari-dentatus. Capsula juniora tantum visa, obovoidea, stipitata, glabra. *Semina* orbicularia, circiter 7 cm. diametro, peltata, corpore centrali orbiculare circiter 1·3 cm. diametro et ala circiter 2·5 cm. lata membranacea margine crenulata.

Sierra Leone: *Lane-Poole* 186 (type); Matotaka, *Thomas* 1287 (partly); Pihalla, Pujehun District, *Dawe*.

Known to the Mendi tribe as "Tomai."

V.—DIACRODON, A NEW GENUS OF RUBIACEAE FROM BRAZIL.

T. A. Sprague.

In a small collection of dried specimens from the State of Ceará, Brazil, received from Mr. B. G. C. Bolland in 1925, were flowering specimens of a Rubiaceous plant, which was identified as a *Borreria*, and assigned provisionally with some hesitation to *B. verticillata* (L.) G. F. W. Mey., as being possibly a form with abnormal flowers. Examination of good fruiting material recently received from Mr. Bolland in a second collection from the same region, however, has shown that the plant is not only specifically but generically distinct from *B. verticillata* in spite of the great similarity that subsists between it and that species, not only in general facies but also in many details of floral structure.

The fruits of Mr. Bolland's plant agree with *Borreria verticillata* in being crowned by the two persistent calyx-segments but differ in being strongly compressed, one-seeded and indehiscent, two of these characters suggesting the generic and specific names *Diacrodon compressus*. The tribe *Spermacoceae*, in which *Borreria* is included, may be regarded as the tropical analogue of the temperate tribe *Galieae*, from which it differs in the stipules being laciniate instead of foliaceous. Of the 18 genera recognized by K. Schumann (Engl. and Prantl, Pflanzenfam. iv. Abt. 4, 139: 1891), 8 have dehiscent fruits, 7 are schizocarpic and only 3, *Hydrophylax*, *Ernodea* and *Gomphocalyx*, have fruits which neither dehisce nor separate into mericarps. It is uncertain whether the fruit of the recently described genus, *Tobagoa* Urb. (Fedde, Repert. xiv. 341: 1916), is dehiscent or not. That of *Micrasepalum* Urb. (Symb. Antill. vii. 548: 1913) is unknown. Though the nature of the fruit of *Diacrodon* is so different from that of *Borreria verticillata*,

the agreement in other characters is so close that it might be regarded as a *Borreria* which has become monospermous and indehiscent. The primary division of the *Spermacoceae* by K. Schumann according to the character of the fruit is apparently artificial, the progression, capsule-schizocarp-achene, being one which may have occurred in more than one line of descent. According to Schumann's classification, which follows his clavis exactly, *Diacrodon* should be placed after *Ernodea*, but its real affinity, as indicated above, is with *Borreria*.

The flora of Ceará is evidently very imperfectly known. Mr. Bolland's first small collection from the country inland of Fortaleza included a new species, *Inga Bollandii*, described in *Kew Bull.* 1926, 241, and the second contained excellent material of the little-known *Stryphnodendron coriaceum* Benth., which was previously unrepresented in the Kew Herbarium, as well as a very distinct new species of *Tephrosia*, published in *Kew Bull.* 1927, 249.

Diacrodon *Sprague* [Rubiaceae-Spermacoceae]; genus novum, *Borreriae* G. F. W. Mey. affine, fructibus applanatis indehiscentibus monospermis necnon seminibus lateraliter compressis dignoscitur.

Calycis segmenta 2, tubo brevi hyalino connexa. *Corolla* tetramera, infundibulari-rotata, tubo intus circa medium annulo pilorum instructo. *Stamina* apice corollae tubi inserta, igitur longe exserta. *Ovarium* biloculare ovulis pro loculo solitariis circa medium septi affixis. *Fructus* valde compressus, indehiscens, loculo altero sterili, altero monospermo, pericarpio papyraceo. *Semen* oblongum, lateraliter valde compressum, hilo elongato bilineato, endospermio copioso, embryone recto, radicula inferiore. *Cymae* capitatim congestae, bracteis subulato-linearibus instructae.

D. compressus *Sprague*, species unica.

Herba tenax, caule quadrangulari angulis costatis, vix 2 mm. diametro 20 cm. infra apicem, laevi glabro. *Folia* subsessilia, anguste obovata vel oblanceolata, apice acuta, in basin angustata, 2–5 cm. longa, 0·5–1·3 cm. lata, supra nervis lateralibus occultis vel inconspicuis, subtus nervo medio prominente hinc inde tuberculo hyalino instructo, nervis lateralibus utrinque 4–7 valde ascendentibus prominulis; stipulae vaginantes ad 3 mm. altae, membranaceae, dentibus circiter 8 filiformi-subulatis circiter 3 mm. longis fimbriatae. *Inflorescentiae* capituliformes, terminales et in axillis foliorum superiorum; cymae bracteis numerosis subulato-linearibus usque ad 2·5 mm. longis hyalinis instructae. *Calycis segmenta* herbacea, anguste hyalino-marginata, linearia, acuta, 1·5 mm. longa, extra marginibusque pilis brevibus inflatis acutis hyalinis induta, inferne tubo calycino hyalino ciliato, ciliis glandulis stipitatis paucis intermixtis, circiter 0·4 mm. alto connexa. *Corolla* infundibulari-rotata; tubus 2 mm. longus, intus annulo pilorum medio instructus, corolla ceterum glabra; lobi deltoidei, 1·8 mm. longi, basi 1·5 mm. lati. *Stamina* incisuris corollae affixa; filamenta circiter 1·7 mm. longa;

antherae oblongae, 1·1–1·2 mm. longae, basi sinu angustissimo vix manifesto 0·5 mm. longo cordatae. *Discus epigynus* bilobus lobis circiter 0·2 mm. longis. *Ovarium* lateraliter applanatum, obovato-oblongum, 1·75 mm. longum, 0·8 mm. latum, marginibus incrassatis e calycis segmentis decurrentibus triente inferiore glabra excepta dense hyalino-pilosis; stylus 4 mm. longus; stigma capitatum, bilobum. *Ovula* infra medium septi affixa, circiter 0·7 mm. longa. *Achaenia* circuitu oblongo-turbinata, valde applanata, calyce persistente excluso 3–3·5 mm. longa, 1·7–2 mm. lata, superne albo-pilosula, inferne glabra, lineis brunneis multis longitudinalibus notata, calycis segmentis persistentibus parte connexo incluso circiter 1·3 mm. longis coronata. *Semina* obovato-oblonga, 2·2–2·5 mm. longa, 0·8 mm. lata, testa brunnea minute reticulata, hilo fere per totam longitudinem seminis currente bilineato lineis e squamis longitudinaliter dispositis constantibus. *Embryo* 2 mm. longus; cotyledones oblongae, apice rotundatae, 0·8 mm. longae, 0·25–0·3 mm. latae.

BRAZIL. Ceará: Fortaleza, 20 miles inland, on the plains, *Bolland*.

VI.—NOTES ON NEW CALEDONIAN ORCHIDS.

F. KRAENZLIN.

Aeranthus sphenochilus *Kraenzl.* nov. sp.; differt ab *A. cymbalariaefolio* F. Muell. et Kraenzl. statura etiam minore, labelli lobo intermedio triangulo-acuminato.

Plantula minuta, 2–5 cm. alta. *Caulis* tenuissimus, monophyllus. *Folium* plerumque medio in caule, latissime ovatum, brevissime acutatum, fere orbiculare, 7–10 mm. longum et latum; pedunculus ut videtur semper monanthus (vidi specimina 7), 10–15 mm. longus; bractea oblonga, acuta, 3 mm. longa, ovarium subaequans vel paulo brevior. *Sepala* linearia, longe et tenuissime acuminata, 8–9 mm. longa, 1 mm. lata. *Petala* ligulata vel oblonga, nervo medio in caudam filiformem producto, circiter 8 mm. longa, 2 mm. lata (excepta cauda filiformi). *Labellum* e basi cuneata sensim dilatatum, rotundatum, in apicem vel lobum intermedium productum (si mavis lobis lateralibus e basi ipsa obtriangulis ubique connatis, lobo intermedio anteposito), trinervium, totum labellum circiter 10 mm. longum, antice 3 mm. latum; lobus intermedius 1·5–2 mm. longus. *Gynostemium* 5–6 mm. longum, superne curvatum, pro rata crasse capitatum.—Fl. Maio.

NEW CALEDONIA. Sous les broussailles a l'entrée de la forêt du Mt. Roghi, 450 m., *G. Bonati* 814.

Aeranthus elegans *Rchb. f.* in Linnaea xli. 56 (1877).; [Diagnosis aucta.] Differt haec species a ceteris generis racemo plurifloro, floribus minutis, bracteis inferioribus pro rata magnis.

Caules 9–16 cm. longi, fragiles, semipellucidi. *Folia* paulo supra dimidium totius plantae inserta, ovato-triangula, acuta, margine

leviter repanda, basi profunde cordata, 1·2–3 cm. longa, 8–18 mm. lata, minute apiculata; pedunculus suprafoliaceus cum inflorescentia 3–10-flora interdum ad 8 mm. longus; bracteae infimae late ovato-triangulae, acutae, trinerviae (addito interdum utrinque nervo vix conspiciendo), bracteae superiores multo minores, anguste ovatae, omnes pedicellos sine ovariis aequantes, inferiores 5 mm. longae, basi 4 mm. latae. *Sepala* anguste linearia, 4 mm. longa, vix 0·5 mm. lata. *Petala* linearia, 2·5 vel 2 mm. longa. *Labellum* late oblongum, apiculatum, medio lineis 3 percursum, 3 mm. longum, circiter 2 mm. latum. *Gynostemium* e basi paulo latiore attenuatum, curvatum, apice capitatum.—De colore nil constat—Fl. Maio. New Caledonia. Entrée de la forêt du Mont Roghi, *G. Bonati* 815.

I am convinced this is the plant described by Reichenbach in Linnaea xli. 56 (1877), from a specimen collected by Vieillard, though some characters seem to be similar but not identical. It is to be regretted, consequently, that Reichenbach suppressed the numbers by which Vieillard's plants are distributed. The description quoted above is too short and insufficient.

Dendrobium Comptonii *Rendle*, in Journ. Linn. Soc. Bot. xlv, 247 (1921).

New Caledonia. Gatope, *Vieillard* 2287.

I am not quite sure if this plant is not the same as *D. jocosum* Rchb. f. also collected by Vieillard, and described by Reichenbach on page 91 of the paper quoted under the preceding species. Reichenbach's original diagnosis is by no means satisfactory. Notes on the dimensions are wanting and also the collector's number.

VII.—NOTES ON AFRICAN GRASSES: VI.

New Species.

Phacelurus caespitosus *C. E. Hubbard*, sp. nov.; affinis *P. specioso* C. E. Hubbard (comb. nov. ex *Andropogone specioso* Steud.), sed culmis caespitosis simplicibus 2–3-nodis, ligulis scariosis glabris, laminis anguste linearibus fere glabris, racemis solitariis erectis differt.

Gramen perenne, caespitosum, innovationibus intravaginalibus. *Culmi* erecti, e rhizomate brevi orti, 55–65 cm. alti, graciles, simplices, basi vaginarum basibus vetustis vestiti, inferne leviter compressi, superne teretes, glabri laevesque, 2–3-nodi. *Foliorum* vaginae moderate arctae, carinatae, striatae, pallidae, glabrae laevesque vel prope os sparse pilosae, internodiis breviores; ligulae truncatae vel rotundato-truncatae, 1·5 mm. longae, scariosae, glabrae; laminae anguste lineares, longe et tenuiter acutae, ad 23 cm. longae et 2 mm. latae, planae vel conduplicatae, rigidulae, striatae, basi et post ligulam sparse albo-pilosae, ceterum glabrae, glauco-virides, marginibus leviter incrassatis et costa tenuissima scaberulis. *Racemi* solitarii, spiciformes, 6–8 cm. longi, 3–3·5 mm. diametro, erecti,

graciles, stricti, purpurei, fere glabri, e vagina summa longe exserti ; articuli lineares, 6–13 mm. longi, dorso pubescente striato convexi, facie concavi, apice oblique truncati ciliatique, marginibus breviter ciliatis ; pedicelli lineares, 5·5 mm. longi, inarticulati, liberi, compressi, adpressi, marginibus breviter ciliatis. *Spiculae sessiles* anguste oblongae, 6–7 mm. longae, 1·5 mm. latae, purpureae, glabrae ; callus truncatus, 1 mm. longus. *Glumae* aequales ; inferior obtusa, integra, chartacea, dorso plana vel leviter rotundata, 2-carinata, marginibus tenuiter membranaceis anguste inflexis, carinis supra medium scaberulis, nervis inter carinas 5–8, extra eas 2 ; superior navicularis, latere oblonga, acuta, membranacea, 3–5-nervia, valide carinata, carina ad apicem scaberula. *Anthoecium inferius* sterile ; lemma lanceolato-oblongum, obtusum, explanatum truncatum, 6·5-7 mm. longum, hyalinum, glabrum, 2-nervium ; palea linearis, 2-fida, lemmati aequilonga, hyalina, 2-nervia. *Anthoecium superius* ♀ inferiori aequilongum vel paulo brevius ; lemma explanatum oblongum, acutum, hyalinum, 3–4-nervium ; palea linearis, lemmati aequilonga vel paulo brevior, hyalina, 2-nervia. *Spiculae pedicellatae* sessilibus similes, sed gluma superiore 7-nervia, anthoecio superiore ♂.

Tropical Africa. Rhodesia : Salisbury, in river bank sand, 1500 m., Nov. 1919, *Eyles* 1940.

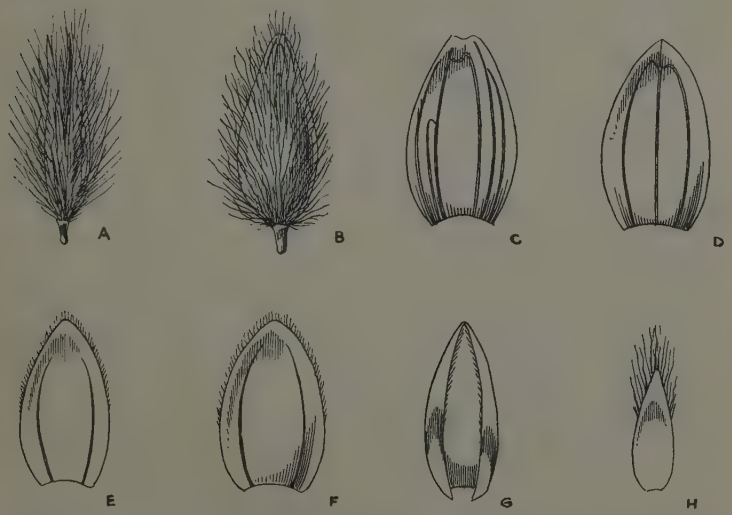
Miscanthidium erectum *Stent et Hubbard*, sp. nov. ; affinis *M. Sorgho* Stapf, sed culmis validioribus, foliorum vaginis longe villosis, spiculis pallidis leviter minoribusque, glumis latioribus dense villosisque, lemmatibus superioribus integris differt.

Gramen perenne. *Culmi* erecti, e rhizomate obliquo orti, 2·2 m. alti, validi, teretes, solidi, simplices, 3–nodi, superne breviter sericeo-pilosi et ad nodos barbati, ceterum glabri laevesque. *Foliorum* vaginae firmae, arctae, pallidae, inferiores leviter compressae, tenuiter striatae, longe et molliter sericeo-villosae, superiores teretes, sparse adpresso-villosae vel glabrae ; ligulae obtusae vel truncatae, 1–2 mm. longae, scariosae, breviter ciliatae ; laminae anguste lineares, basi ad costam mediam reductae, longe et tenuiter acutae, 65-110 cm. longae, applanatae ad 11 mm. latae, firmae, glabrae vel supra laxe pilosae, basi pone ligulam longe pilosae, asperulae. *Panicula* erecta, lineari-oblonga, contracta, densa, 40 cm. longa, 6 cm. lata, argenteo-villosa ; rhachis teres vel superne angulata, glabra, minute scaberula ; rami suberecti vel leviter patentes, 3–16 cm. longi, a basi laxe ramulosi, graciles, filiformes, flexuosi, tenaces, asperuli, articulis breviter barbatis vel glabris ; pedicelli filiformes, apice discoideo-incrassati, inaequales, unus 1–1·5 mm. longus, alter 3–3·5 mm. longus. *Spiculae* anguste oblongae vel dorso ovato-oblongae, pallidae, 3·75–4·25 mm. longae, callo et glumis pilis patulis sericeis albis 1·5–3 mm. longis dense villosis. *Glumae* aequilongae, chartaceae ; inferior late oblongo-elliptica, emarginata, 2-carinata, nervis intra carinas 2, extra carinas utrinque 1-nervia ; superior obtusa, 3-nervia. *Anthoecium inferius* ad

lemma vacuum reductum ; lemma ellipticum, subacutum, 3·5–4 mm. longum, membranaceum, 2-nervium, ciliolatum. *Anthoecium superius* ♂ ; lemma late ellipticum, obtusum, 3·4–3·8 mm. longum, integrum, ciliatum, membranaceum, exaristatum et 2-nervium vel breviter aristatum et 3-nervium ; arista ad 2 mm. longa ; palea lanceolata vel ovata, acuta vel obtusa, 1·5–2·8 mm. longa, hyalina, enervia, apice longe ciliata. *Antherae* atropurpurae, lineari-oblongae, 1·75–2·5 mm. longae.

South Africa. Natal : Eshowe, March 1927, *Kotze* 246. Also common on the outskirts of Zululand forests (*Kotze*).

An awnless form of *M. Sorghum* Stapf, which may be referred to as f. *inermis*, has been collected by Pole Evans (No. 930) in Natal near Castle Howard. It differs from *M. erectum* in having less stout culms, slightly longer and pale brown spikelets, narrower glumes and valves.



Miscanthidium erectum Stent et Hubbard. A and B Spikelet, side and back views. C Lower glume. D Upper glume. E Lemma of lower floret. F and G Lemma of upper floret. F opened out. H Palea. (All × 14).

Hyparrhenia Eylesii *C. E. Hubbard*, sp. nov. ; affinis *H. grallatae* Stapf, sed multo densius caespitosa, culmis 3-nodis, foliorum vaginis tenuioribus prominenter striatis, laminis brevioribus marginibus scaberulis, spatheolis glabris, spiculis atrobrunneis laxe pilosis differt.

Gramen perenne, dense caespitosum, innovationibus intravaginalibus. *Culmi* erecti, 80–115 cm. longi, moderate graciles, ad 3·5 mm. diametro, teretes vel inferne leviter compressi, simplices, glaucescentes, glabri laevesque, infra paniculam 3-nodi. *Foliorum* vaginae arctae, teretes, tenuiter chartaceae, prominenter striatae,

glabrae laevesque vel eae innovationum sparse pilosae; ligulae rotundato-truncatae, 1–1·5 mm. longae, scariosae, ciliolatae; laminae lineares, longe et tenuiter acutae, 5–18 cm. longae, 2–6 mm. latae, planae, rigidulae, glaucae, eae innovationum pilis albidis laxe et molliter villoso-pilosae vel villosae, eae culmorum demum glabrae, marginibus scaberulis, costa gracillima. *Panicula* angusta, 45–60 cm. longa, spatheata, 3–4-noda; internodia 9–19 cm. longa; rami simplices, solitarii vel 2–nati, ad 27 cm. longi, leviter patentes; spatheolae angustissimae, acuminatae, 7·5–10 cm. longae, arcte convolutae, tenues, glabrae laevesque, rubro-brunneae, purpurascentes vel virides; pedunculi tenuiter filiformes, 10–14 cm. longi, spatheolas aequantes vel plerumque exserti, stricti vel leviter curvi, sparse pubescentes. *Racemi* graciles, moderate laxi, 3–4·5 cm. longi, 4–6-spiculati, laxe albido-pilosi; bases racemorum graciles, filiformes, pubescentes, inferior brevissima, superior 3–5 mm. longa; articuli 4–6, 2–3·5 mm. longi, tenuiter filiformes, valde oblique truncati, dorso sparse pilosi, dense albido-ciliati; pedicelli articulis similes. *Spiculae sessiles* lineari-oblongae vel lanceolato-oblongae, 6–7 mm. longae, 1·2 mm. latae, atrobrunneae, laxe albido-pilosae; callus gracillimus, pungens, 3–4 mm. longus, dense albido-pilosus. *Glumae* aequales, firme chartaceae, pilis albis laxis 1–2 mm. longis pilosae; inferior truncata vel obtusa, dorso fere plana, 9-nervia, nervis viridibus, marginibus involutis; superior lanceolata vel lanceolato-oblonga, in aristam tenuissimam pallidam 7–13 mm. longam producta, 3-nervia, marginibus retrorso-ciliatis. *Anthoecium inferius* sterile; lemma applanatum oblongum, acutum vel truncatum, 5–5·5 mm. longum, obscure 2–3-nervium, hyalinum, purpurascens, retrorso-ciliatum; palea O. *Anthoecium superius* ♀; lemma stipitiforme, 5–6 mm. longum, 2-lobum, lobis acutis ciliatis 2–3·5 mm. longis, hyalinum; arista gracilis, 2·8–4·2 cm. longa, geniculata, tenuiter pubescens; palea O; caryopsis oblonga, 3 mm. longa. *Spiculae pedicellatae* ♂, anguste lanceolatae, 8–9 mm. longae, spiculis sessilibus similes; callus 2 mm. longus. *Glumae* aequales, firme chartaceae; inferior oblongo-lanceolata, tenuiter acuta, 9–11-nervia; superior lineari-lanceolata, tenuiter acuta, 5-nervia. *Lemma* anthoecii inferioris lanceolato-oblongum, acutum, 6–7·6 mm. longum, hyalinum, 2–3-nervium, retrorso-ciliatum. *Lemma* anthoecii superioris lineare, 2-fidum, 5–5·5 mm. longum, hyalinum, 1-nervium, purpurascens, apice ciliatum.

Tropical Africa. Rhodesia: Goromonzi, open sand veld, 1560 m., April 1927, *Eyles* 4880.

Hyparrhenia Snowdenii *C. E. Hubbard*, sp. nov.; affinis *H. hirtae* Stapf, sed culmis laxe caespitosis, laminis foliorum viridibus (non glaucis) molliter pilosis, spatheolis pedunculis et racemis brevioribus, racemis 2-aristatis differt.

Gramen perenne, laxe caespitosum, 50–180 cm. altum. *Culmi* erecti vel geniculato-ascendentes, ad 2 mm. diametro, graciles, teretes, ramosi, ramis sterilibus e nodis inferioribus, infra paniculam

2–4-nodi, glabri laevesque. *Foliorum* vaginae laxae, demum solutae, teretes, tenuiter striatae, internodiis breviores, laeves, glabrae vel superne pubescentes; ligulae truncatae, ad 1 mm. longae, scariosae, ciliolatae vel glabrae; laminae anguste lineares, longe et tenuiter acutae, 8–20 cm. longae, 2–5 mm. latae, planae, firmae, supra plerumque purpurascentes vel purpureo-virides, infra virides, laxe et molliter pilosae, marginibus scaberulis. *Panicula* spatheata, elongata, angusta, laxa, 10–35 cm. longa, ad 5 cm. lata; internodia inferiora 4–11 cm. longa, tenuiter filiformia; rami ad 12 cm. longi, 1–4-nati, tenuissime filiformes; spatheolae linearilanceolatae, longe et tenuiter acutae, 3–4 cm. longae, glabrae, laxae, demum arctae, rubro-brunneae vel rubro-purpureae; pedunculi racemorum 2–3·5 cm. longi, curvati, plerumque spatheolis breviores, gracillimi, apices versus pilis albidis vel albido-fulvis patentibus laxis ad 5 mm. longis e tuberculis minutis pilosi. *Racemi* subcontigui demum divaricato-patentes, erecti vel nutantes, 1–1·5 cm. longi, 2-aristati, basi utriusque racemi uno pare spicularum homogamarum 5 mm. longarum; racemus inferior sessilis; basis racemi superioris gracillima, 2·5–4 mm. longa, tenuissime filiformis, longe et patente pilosa; articuli oblique truncati; articuli et pedicelli filiformes, gracillimi, 3·5–4·5 mm. longi, pilis ad 1·5 mm. longis dense ciliati. *Spiculae sessiles fertiles* lineari-oblongae vel lanceolato-oblongae, 4 mm. longae, glabrae, purpurascentes vel virides; callus linearis, acutus, 1–1·5 mm. longus, breviter sericeobarbatus. *Glumae* aequales; inferior truncata, dorso leviter concava vel plana, tenuiter chartacea, superne 9-nervia, marginibus involutis superne carinatis et minutissime setulosis; superior truncata vel rotundato-truncata, membranacea, 3-nervia, marginibus superne ciliatis. *Anthoecium inferius* ad lemma reductum; lemma lineari-oblongum, truncatum, 4 mm. longum, hyalinum, 2-nervium, superne retrorso-ciliatum. *Anthoecium superius* ♀; lemma anguste lineare vel stipitiforme, 3–3·5 mm. longum, 2–lobum, lobis brevibus angustis acutis ciliatis; arista 2·5–3 cm. longa, bigeniculata, columna minute fulvo-hirsuta; palea oblonga, denticulata, ad 1 mm. longa, hyalina. *Spiculae pedicellatae* ♂, linearilanceolatae vel lineari-oblongae, tenuiter acutae, 5–6 mm. longae, glabrae. *Glumae* aequales; inferior 11-nervia, breviter aristata, arista ad 1·5 mm. longa, carinis superne ciliolatis; superior 3-nervia, acuta, superne retrorso-ciliata. *Lemmata* lineari-oblonga, hyalina, retrorso-ciliata. *Antherae* lineares, 2–2·5 mm. longae.

Tropical Africa. Uganda: Budama; Samia, 1200 m., in savannah, July 1927, *Snowden* 1150.
Vern. name: *Bunyisi* (Samia).

Hyparrhenia Pilgeriana *C. E. Hubbard*, nom. nov. *Cymbopogon Stolzii* Pilger in Engl. Bot. Jahrb. liv. 286 (1917), non *Hyparrhenia Stolzii* Stapf in Prain, Fl. Trop. Afr. ix. 364 (1918).

Tropical Africa. Uganda: Mbale, near Mt. Elgon, moist places in savannah, 1200 m., June 1927, *Snowden* 1105. Tanganyika Territory: Kyimbila, 1350 m., Nov. 1911, *Stolz* 960! (type).
Vern. names: *Lunyafa* (Lugishu); *Mbubu* (Luganda); *Lusane lunandi* (Kyimbila).

The specific name of *Cymbopogon Stolzii* Pilger has to be changed on transference of the species to *Hyparrhenia* as it is preoccupied in that genus.

Digitaria verrucosa *C. E. Hubbard*, sp. nov.; affinis *D. angolensi* Rendle, sed culmis paucinodis, laminis foliorum lanceolatis minoribus, racemis brevibus 2–3-natis, spiculis paulo majoribus ellipticis vel ovato-ellipticis differt.

Gramen annuum. *Culmi* erecti, laxi, 50 cm. alti, graciles, teretes, glabri laevesque, glauco-purpurei, 3–4-nodi, inferne ramosi. *Foliorum* vaginae arctae, demum laxae, internodiis breviores, tenues, carinatae, glabrae laevesque vel ore raro pubescentes, purpureae vel virides; ligulae oblique truncatae vel rotundato-truncatae, 0·5–1·5 mm. longae, scariosae, glabrae; laminae anguste lanceolatae vel lanceolatae, acute acuminatae, basi valde inaequilaterae, 2–7 cm. longae, 3–7 mm. latae, planae, glabrae, marginibus cartilagineis purpureis scaberulis, uno margine crispo, infra costa gracillima distincta, nervis primariis 6 tenuissimis. *Racemi* graciles, 2–3, sessiles in axi communi ad 1 cm. longo, 3·5–6·5 cm. longi, erecti vel leviter patentes, stricti vel leviter flexuosi; rhachis gracillima, triquetra, 0·5 mm. lata, scaberula; pedicelli 2–3-nati, inaequales, 2–5 mm. longi, erecti vel leviter patentes, tenuiter filiformes, angulati, minute scaberuli. *Spiculae* ovato-ellipticae vel ellipticae, acutae vel acute acuminatae, 2·5–2·9 mm. longae, 1–1·2 mm. latae, pallidae vel purpureo-suffusae, obscure sericeo-pilosae. *Gluma* inferior ad 0·4 mm. longa, truncata vel rotundato-truncata, tenuissima, hyalina; gluma superior anguste elliptica vel anguste elliptico-oblonga, acuta, spiculam aequans, tenuiter membranacea, 3-nervia, lineis quaternis pilorum subtiliter pilosa, pilis brevibus verrucosis purpureis sericeis adpressis. *Anthoecium inferius* sterile; lemma explanatum ellipticum, acutum, spiculam aequans, tenuiter membranaceum, 5-sub-7-nervium, quoad pubescentiam glumae superiori simile sed pilis exterioribus longioribus et ad 1 mm. longis; palea minuta, hyalina. *Anthoecium superius* ♂, anguste oblongo-ellipticum, acutum vel acute acuminatum, 2·5 mm. longum, pallidum, tenuiter chartaceum.

Tropical Africa. Rhodesia: Salisbury, dry edge of swamp, 1440 m., April 1927, *Eyles* 4859.

Paspalum scrobiculatum *L.* var. **Deightonii** *C. E. Hubbard*, var. nov.; affinis *P. scrobiculato* var. *Commersonii* (Lam.) Stapf, sed culmis reptantibus e nodis radicantibus, laminis foliorum latioribus obtusioribus tenuioribusque, rhachibus laevibus differt.

Gramen perenne. *Culmi* e basi nodis multis radicante atque innovationes breves emittente ascendentes, ad 40 cm. alti, simplices. *Foliorum* vaginae plerumque internodiis breviores, nodis et partibus inferioribus villosis ; laminae lanceolato-lineares vel lineari-oblongae, subacutae, 3·5–13 cm. longae, 7–14 mm. latae, planae, glabrae, marginibus plerumque ciliatis. *Racemi* 2, 3·5–4·5 cm. longi ; rhachis internodium 1·5 cm. longum ; rhachis glabra, 1–1·5 mm. lata ; pedicelli 0·5–1 mm. longi. *Spiculae* late ellipticae vel fere orbiculatae, rotundato-obtusae, 2·5–2·8 mm. longae, 2–2·4 mm. latae.

TROPICAL AFRICA. Sierra Leone : Freetown, in shade, August 1927, *Deighton* 777.

VIII.—CAMPHORINA AND SEPTINA. T. A. SPRAGUE.

According to Merrill (Bot. Gaz. 1920, lxx. 84), Farwell has adopted the generic name *Camphorina* Noronha (1790) in place of *Cinnamomum* Blume (1825), and has published a considerable number of new combinations under the former name in a strictly trade journal (Druggists Circular, lxii. 535 : 1918), where they will probably not be noticed by systematists. Reference to Noronha's paper, however, shows that *Camphorina* was published *without description*, and is therefore invalid under International Rules ; furthermore, there appears to be no evidence that it is congeneric with *Cinnamomum*, or even that it belongs to the Lauraceae. The only information about *Camphorina* given by Noronha was that the vernacular [Sundanese] name in Java was Kichantùm, and that the genus consisted of a single (unspecified) species.

Hasskarl, who had made a special study of Sundanese plant-names, suggested (Tijdschr. Nat. Gesch. xi. 213 : 1844) that it might be one of the Anonaceae, possibly *Polyalthia* Blume. The Sundanese name Ki-tjantoeng is applied to *Polyalthia subcordata* Blume (Filet, Plantk. Woordenb. Ned. Ind. 183, n.4767 ; De Clercq, Nieuw Plantk. Woordenb. Ned. Ind. 309, n.2803), and to *Goniothalamus macrophyllus* (Blume) Hook. f. (Blume, Fl. Jav. Anonac. 79 ; Koord. et Valet. in Meded. s'Lands Plantent. lxi. 309)—both Anonaceae. The compound name Ki-tjangtoeng-aroij is used (according to Filet. l.c., n.4765) for *Habzelia acuta* Miq., *Melodorum Kentii* Hook. f. et Thoms., *Oxymitra cuneiformis* Zoll., *O. latifolia* Hook. f. et Thoms., *Polyalthia elliptica* Blume and *Uvaria macrophylla* Roxb.—all also belonging to the Anonaceae.

There is thus no justification for substituting the name *Camphorina* for *Cinnamomum*, and it is to be regretted that Farwell did not verify the circumstances attending the publication of *Camphorina* instead of merely taking on trust the synonymy given by Dalla Torre and Harms. If he had even consulted Post and Kuntze's Lexicon Generum Phanerogamarum ("1904") he would have discovered that *Camphorina* was a *nomen nudum*. It is difficult to ascertain who was originally responsible for the suggestion that

Camphorina might be synonymous with *Cinnamomum*. It was reduced—with a query—to *Cinnamomum* in Index Kewensis, i. 407 (1893), but there is nothing to show from what source, published or unpublished, the reduction was derived, and the name *Camphorina* was not included in the synonymy of *Cinnamomum* given in Index Kewensis, i. 539. Dalla Torre and Harms (Gen. Siphonog. 176 : 1901) definitely cited *Camphorina* Noronha as a synonym of *Cinnamomum*. Neither they nor the Index Kewensis mentioned that it was published without description.

Septina Noronha, which Dalla Torre and Harms also included under *Cinnamomum*, is likewise a *nomen nudum*, the only information supplied by Noronha being that the vernacular name in Java was Hurù-mèra, and that the genus was monotypic. Hasskarl (l.c. 215) suggested that it might belong to the Lauraceae, and according to Filet (Plantk. Woordenb. Ned. Ind. 120) Hoeroe-meirah is the Sundanese name for *Cinnamomum iners* Blume. Blume (Bijdr. Fl. Ned. Ind. 570) cited it under that species in the form Huru mirha. Hence *Septina* may actually be a synonym of *Cinnamomum*, as has been suggested, but cannot replace it under any rules of nomenclature.

The citation of *Camphorina* Noronha given in Index Kewensis and by Dalla Torre and Harms is " Verh. Batav. Gen. v. (1790), ed. 1, Art. IV. 1 ". The writer has not had access to the first edition of vol. v., but has examined Noronha's paper in the second edition of that volume in the library of the British Museum (Nat. Hist.), which according to Scudder (Cat. Scient. Serials, 47, n. 725 ; 251, n. 3767c) is merely a reprint. In this reprint of vol. v., published in 1827, the Articles are not numbered, and the pagination is continuous, *Camphorina* occurring on p. 64 and *Septina* on p. 66.

IX.—CONTRIBUTIONS TO THE FLORA OF BURMA: V.*

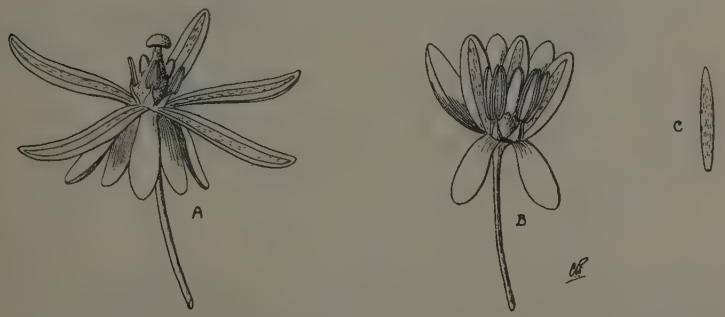
Hydnocarpus verrucosa *Parkinson et Fischer* [Flacourtiaceae] ; affinis *H. castaneae* Hook. f. et T., sed foliis minoribus lanceolatis acuminatis basi aequalibus siccitate viridibus, fructu valde majore verrucoso differt.

Tree 20–25 m. high ; bark thin, smooth, greenish-grey to brown ; twigs brown, glabrescent, innovations fulvous-pubescent. *Leaves* rigidly chartaceous, lanceolate, apex tapering to an acuminate point, base equal, rounded or cuneate, 10–21 cm. long, 3–6 cm. wide, quite glabrous, midrib, 7–9 pairs of primary nerves and finely reticulate venation raised on both surfaces ; petiole rugulose, channelled above, 1–1·5 cm. long. *Inflorescence* of few-flowered, axillary racemes ; peduncles 2–3 mm. long, with a few minute bracts at the apex, fulvous-puberulous ; pedicels erect, 3–3·5 cm. long, fulvous-puberulous. *Buds* subglobose. *Flowers* unisexual, dull-white.

*Continued from *K.B.* 1927, p. 314.

♂ *Sepals* 5, narrowly oblong, obtuse, 6–7 mm. long, fuscous-puberulous on both surfaces. *Petals* 5, lanceolate, subacute, 1·2–1·3 cm. long, glabrous. *Scales* 5, linear-lanceolate, as long as the petals, sparsely hairy. *Stamens* 5, nearly as long as the petals, glabrous ; filaments ensiform from a very broad base, about 3 mm. long ; anthers extrorse, narrowly oblong, rounded at both ends, about as long as or slightly longer than the filaments. *Rudimentary ovary* subglobose or narrowly conical, shorter than the stamens, densely fuscous-tomentose. ♀ *Sepals, petals* and *scales* slightly longer than those of the ♂. *Staminodes* 5, glabrous ; filaments short, flat, broadly triangular-ovate ; anther empty, elliptic-oblong or ovate, flat, longer than the filament. *Ovary* subglobose or ellipsoid, narrowed into a short beak, longer than the staminodes, densely fuscous-villous, stigma peltate, recurved. *Fruit* a woody, depressed-globose, thick-walled berry 8–11 cm. in diam., densely fulvous-villous when young ; when mature glabrous, brown and densely warted and stalk much thickened. *Seeds* oblong, angular by compression, 2–3 cm. long.

Amherst District. Dawna Hills, 800 m., Feb., *C. E. Parkinson* 5240. Vernacular name : *Woh-panh* (Karen.).



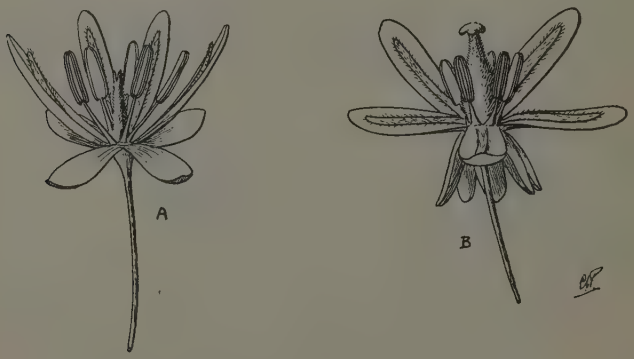
Hydnocarpus verrucosa. A ♀ flower ; B ♂ flower ; C scale of ♀. All × 2.

Hydnocarpus dawnensis *Parkinson et Fischer* [Flacourtiaceae] ; affinis *H. verrucosae* Park. et Fisch., sed foliis basi inaequalibus, floribus polygamis, fructu valde minore non verrucoso differt.

A *tree* ; branchlets pale-brown, glabrous, innovations scurfy fulvous-puberulous. Leaves rigidly chartaceous, lanceolate or linear-lanceolate, obtuse or subacute, base unequal, rounded or acute, 8–15 cm. long, 2·5–5 cm. wide, glabrous, midrib, 6–8 pairs of primary nerves and finely reticulated venation raised on both surfaces, petioles 0·7–1·4 cm. long, channelled above, glabrous. *Flowers* androgynous, in short, axillary, few-flowered racemes ; peduncles very short, scurfy fulvous-puberulous with several minute bracts at the apex, pedicels slender, 2–2·5 cm. long, fuscous-pubescent. ♀ *Sepals* 5, shortly connate below, ovate-oblong, obtuse, about 8 mm. long, fuscous-pubescent on both surfaces. *Petals* 5, lanceolate, 1–1·2 cm. long, glabrous. *Scales* 5, linear, about ¾ the length of the

petals, subacute, ciliate and sparsely hairy. *Stamens* 5, glabrous, about ½ the length of the scales ; filaments coriaceous, flat, broadly triangular-ovate, shortly filamentous at the apex ; anthers extrorse, linear-oblong, longer than the filaments. *Ovary* ellipsoid, narrowed into a short beak, slightly longer than the stamens, fuscous tomentose ; stigma peltate, lobed. ♂ *Sepals, petals* and *scales* similar to those of the ♀. *Stamens* 5, as long as the scales, glabrous ; filaments flat, narrowly ensiform, tapering to a short filamentous apex ; anthers narrowly linear-oblong, as long as the filaments. Rudimentary *ovary* subulate, about ¾ the length of the stamens, apex toothed, fuscous-tomentose. *Fruit* an ovoid, woody berry 2–3 cm. long, fulvous-pubescent ; stalk stout, woody.

Amherst District. Dawna Hills, 400 m., April, *Maung Soe Min* per *C. E. Parkinson* 432. Vernacular name : *Kalaw byu* (Burmese). " Growing in moist forest."



Hydnocarpus dawnensis. A ♂ flower; B ♀ flower. Both × 2.

Cissus assamica *Craib* var. **pilosissima** *Gagnep.* [Ampelidaceae.] The typical form known from Assam and the variety from Indo-China.

Tavoy. Tenasserim River, Jan., *R. N. Parker* 2490. " Extensive climber."

Dracontomelum Duperreanum *Pierre* [Anacardiaceae].

Known only from Tonkin.

Katha District. Mawlu Range, May, *Forest Range Officer* per *C. E. Parkinson* 189. Vernacular names : *Tawtitcha, Ngabauk* (Burmese).

Shuteria hirsuta *Baker* [Papilionaceae].

Known from Khasia and Sikkim.

Tavoy. Tenasserim River, Jan., *R. N. Parker* 2418. " Prostrate climber rooting at intervals. Flowers purplish-blue. In dry bamboo forest."

The standard of the flower is minutely auriculate at the base of the limb. In the Kew Herbarium there are also the following specimens of this species: Shan hills, *Collett*; Katha District, *J. H. Lace*; Tenasserim, "Mowleyit," *Beddome*.

Pahudia cochinchinensis *Pierre* [Caesalpiniaceae].
Known from Indo-China.
Mandalay District. Kywet năpā Reserve, 575 m., Dec., *Maung Mya* per *Forest Botanist Burma* 3683. Vernacular name:—*Thit lawt* (Burmese).

Ardisia sumatrana *Miq.* [Myrsinaceae].
Known from the Malay Peninsula and Archipelago.
Mergui. Tenasserim River, Jan., *R. N. Parker* 2498. "Tree 40 ft. high, 6 in. diam. Bark smooth; flowers white, waxy; fruit claret-coloured."

Peronema canescens *Jacq.* [Verbenaceae].
Known from the Malay Peninsula and Archipelago.
Mergui District. Lenya Valley, Feb., *R. N. Parker* 2716. "Medium sized tree, not uncommon. Leaflets about 8 pairs."

Sphenodesme mollis *Craib.* [Verbenaceae].
Known from Siam.
Tavoy. Tenasserim River, Jan., *R. N. Parker* 2436.

Balanophora indica *Wall.* [Balanophoraceae].
Known from Southern India.
Mergui District. Molodaung, Jan., *R. N. Parker* 2455. Also in Herb. Kew: Amherst District, Dawna Hills, 3000–5000 ft., *J. H. Lace* 5629.

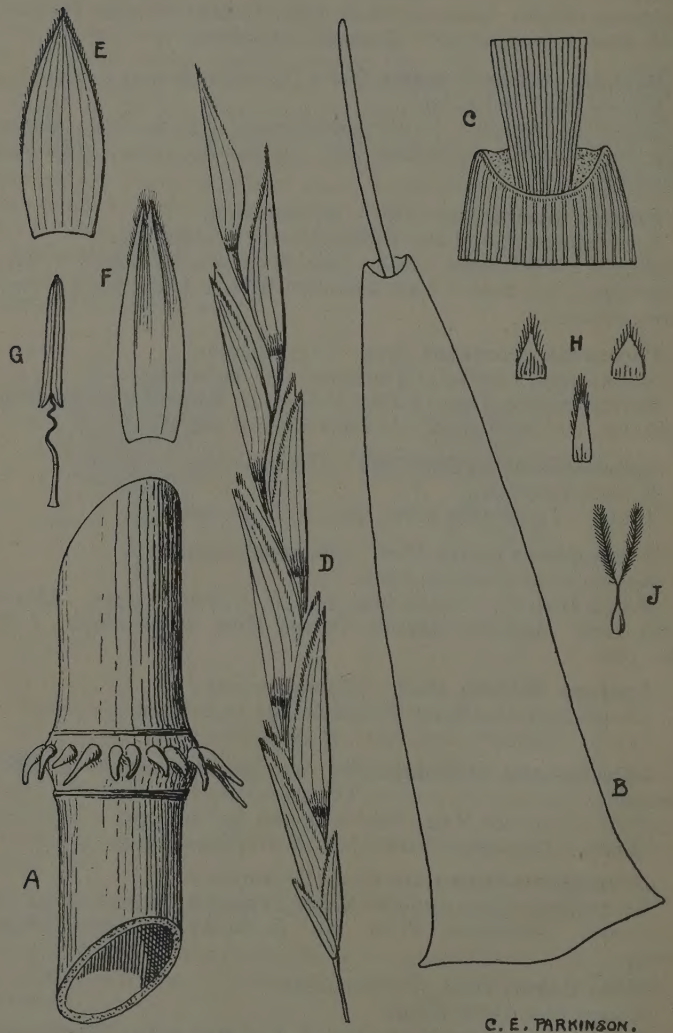
Aporosa ficifolia *Baill.* [Euphorbiaceae].
Known from the Malay Peninsula and Indo-China.
Tavoy. Zimba Valley, Nov., *R. N. Parker* 2230.

Dalechampia bidentata *Bl.* var. **genuina** *Pax.* [Euphorbiaceae].
Known from the Malay Peninsula and Archipelago.
Tavoy. Tenasserim River, Jan., *R. N. Parker* 2412.

Debregeasia squamata *King* [Urticaceae].
Known from Siam and the Malay Peninsula.
Tavoy. Tenasserim River, Jan., *R. N. Parker* 2401. "Fruit orange."

Musa Bakeri *Hook. f.* [Musaceae].
Known from Cochinchina.
Tavoy. Tenasserim River, Jan., *R. N. Parker* 2447. "Indigenous and common. Fruit said to be edible, but full of seeds."

Habenaria furfuracea *Hook. f.* [Orchidaceae].
Known from the Khasia Hills.
N. Shan States. Gokteik Gorge, 800 m., *C. E. Parkinson* 1726.



Arundinaria Gallatlyi Gamble. A Portion of culm showing node; B Culm sheath; C Top of culm sheath; D Spikelet; E Lemma; F Palea; G Stamen; H Lodicules; J Ovary.
A and B about natural size. C–J all enlarged ×3.

Arundinaria Gallatlyi *Gamble* [Gramineae]; Ann. Roy. Bot. Gard. Calc. vii. 23. The culm sheaths and inflorescence were unknown when the species was described by Gamble in 1896. No reference was made by him to the spinous nodes. The type specimen of this amplified description (*C. E. Parkinson* 5126 in Herb. Kew.) was collected in the same locality where Gallatly collected his specimen (Gamble's type) in 1877.

Densely tufted and attaining a height of 4·5–7·5 m. *Culms* cylindrical, 2–2·5 cm. diam., green, glabrous, hollow, the walls 2–3 mm. thick, the nodes 20–30 cm. apart, thickened and furnished with a ring of decurved blunt or sharp spines. *Culm sheaths* papery, finely striate, 10–15 cm. long, 3·5–5 cm. wide at base and 0·8–1·2 cm. wide at the top; blade narrowly lanceolate, 3–5 cm. long, ligule 1–2 mm. wide. *Inflorescence* much branched, forming lax compound terminal and axillary panicles; rachis fine and wiry. *Spikelets* linear, 4–6 cm. long, slender. *Glumes* 2, the lower 5 mm. long, oblong-lanceolate, margins ciliolate in the upper part, 3-nerved; the upper 7 mm. long, ovate-lanceolate, margins ciliolate in the upper part, 5-nerved. *Florets* about 5 to 7 in a spikelet, each about 1·2 cm. long; rachilla compressed and thickened towards the top, 7 mm. long, ciliolate along the two lateral edges, and furnished at the top with a ring of hairs which surround the base of the floret. *Lemma* (flowering glume) ovate-lanceolate, 1·1 cm. long, about 9-nerved, margins ciliate in the upper part. *Palea* 1·2 cm. long, 2-keeled, very slightly 2-cleft and with a few minute hairs at the apex. *Lodicules* 3, a narrowly triangular one 3 mm. long at the base of the palea and 2 ovate-triangular ones barely 2 mm. long opposed, all ciliate. *Stamens* 3 with free filaments, anthers 6 mm. long.

It is uncommon and grows gregariously in small patches at an elevation of about 1800 m. on Mulayit peak in the Dawna hills of Tenasserim in Burma. *C. G. Rogers* 335 T, collected at Maungpok, Nwalabo ridge, at about 1000 m. in the Tavoy District, about 150 miles south of Mulayit peak, is very likely the same species. Vernacular name:—*Wa-thon-dyan* (Karen). (*C. E. Parkinson.*)

X.—MISCELLANEOUS NOTES.

The following appointments have been made by the Secretary of State for the Colonies:—Mr. T. L. Williams, B.Sc., Economic Botanist, Gold Coast: Mr. P. M. McCarthy, A.R.C.S., and Mr. J. F. Ward, B.A., Superintendents of Agriculture, Nigeria: Mr. H. H. Storey, Mycologist, Amani Research Institute, Tanganyika.

Shrubs.*—This is one of the Home Garden Handbooks. Though only a small volume of seventy-six pages, divided into ten chapters, the author has managed to condense within this small compass a

*By F. F. Rockwell, Macmillan & Co., Ltd., London and New York, 1927, pp. viii+76, text figs. Price 4*s.* 6*d.*

really extraordinary amount of useful cultural information. Coupled with this are very exhaustive lists to aid in the selection of shrubs for specific purposes. These include classifications by colour, height, and season of bloom ; suitability for various purposes, backgrounds, hedging, shrubbery groups, etc. ; and also lists of shrubs for various soils and climates, city conditions, etc. The book is illustrated by a number of useful drawings designed to show, as the author aptly remarks, that "there is no more certain and satisfactory way of making your place more beautiful and more valuable than by planting shrubs." Though written for readers in America it contains matter of considerable interest for residents in this country.

Gladiolus.*—This handbook, although written for American readers, contains much useful information that is applicable to conditions in this country, as the cultivation on broad lines is very similar.

The book deals with the various details of cultivation, including several methods of planting, propagation, harvesting and storing. The cultural details are also given for growing for cut flowers and exhibition.

There are chapters dealing with the various types and varieties, hybridising, and the creation of new varieties. Insect pests and diseases and their remedies are also mentioned.

Plants of Trinidad and Tobago.†—This work gives short descriptions in alphabetical order of the many native and exotic plants that are cultivated for ornament or profit in Trinidad and Tobago. In the preface the authors direct attention to the need for such a book as there was no local book of reference dealing with the cultivated plants of those islands. The many species dealt with are usually described under their botanical names, but in most cases native names are also given. Following a brief description of each plant, its useful properties are dealt with, and when necessary this is followed by special cultural directions. The work ends with lists of plants for special purposes and a botanical Key.

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*By F. F. Rockwell, The Home Garden Handbooks, Macmillan & Co., Ltd., London and New York, 1927, pp. viii+79, text figs. Price 4*s.* 6*d.*

†Memoirs of the Department of Agriculture, Trinidad and Barbados. Number 4. The Useful and Ornamental Plants of Trinidad and Tobago by W. G. Freeman and R. O. Williams, Government Printing Office, Port-of-Spain, Trinidad, 1927, pp. 198. Price 2*s.* 6*d.*

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